

# PHYTOLOGIA

An international journal to expedite plant systematic, phylogeographical  
and ecological publication

Vol. 79

July 1995

No. 1

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Published by Michael J. Warnock

185 Westridge Drive Huntsville, Texas 77340 U.S.A.

PHYTOLOGIA is printed on acid free paper.

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PHYTOLOGIA (ISSN 00319430) is published monthly with two volumes per year by Michael J. Warnock, 185 Westridge Drive, Huntsville, TX 77340. Second Class postage paid at Huntsville, TX. © 1995 by PHYTOLOGIA. Annual domestic individual subscription (12 issues): \$40.00. Annual domestic institutional subscription (12 issues): \$44.00. Foreign and/or airmail postage extra. Single copy sales: current issue and back issues volume 72 to present: \$4.00; back issues (previous to volume 72): \$3.00; add \$.75 per copy postage and handling US [\$1.50 per copy foreign]). Back issue sales by volume: \$17.00 per volume 42-71 (not all available as complete volumes); \$21.00 per volume 72-present; add \$3.00 per volume postage US (\$6.00 per volume foreign). POSTMASTER: Send address changes to Phytologia, 185 Westridge Drive, Huntsville, TX 77340-8916.

FEB - 5 1996

NEW YORK  
BOTANICAL GARDENNEW SPECIES AND NEW COMBINATIONS IN *ANREDERA* JUSS.  
(BASELLACEAE)Calvin R. Sperling<sup>1</sup>National Germplasm Resources Laboratory, Room 402, Building 003, Barc-West,  
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## ABSTRACT

Two new species of *Anredera*, *A. aspera* Sperling and *A. densiflora* Sperling, are described, and four new combinations, *A. brachystachys* (Moq.) Sperling, *A. floribunda* (Moq.) Sperling, *A. krapovickasii* (Villa) Sperling, and *A. tucumanensis* (Lillo & Hauman) Sperling, are made. These new species and new combinations are from the unpublished Ph.D. dissertation of Calvin R. Sperling.

KEY WORDS: *Anredera*, Basellaceae, taxonomy

## FORWARD

[J. W. Nowicke, Botany Dept., NHB 166, Smithsonian Institution, Washington D.C.  
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In the course of a palynological study that included *Anredera*, I discovered that two new species and four new combinations established by the late Calvin Sperling (1987) are heretofore unpublished. The Latin descriptions of the two new species, *Anredera densiflora* from Ecuador and Perú, and *A. aspera* from northern Bolivia, and the synonymy of the remaining four new combinations, *A. tucumanensis* (Lillo & Hauman) Sperling, *A. floribunda* (Moq.) Sperling, *A. krapovickasii* (Villa) Sperling, and *A. brachystachys* (Moq.) Sperling, have been taken from Sperling's dissertation. Before his death, he approved publication of these names.

Two more new combinations, *Anredera diffusa* (Moq.) Sperling and *A. marginata* (H.B.K.) Sperling, were recently published (Brako & Zarucchi 1993, p. 1253). In addition to the twelve species of *Anredera*, Sperling treated the remaining three genera that comprise Basellaceae, *Basella* L. (5 species), *Tournefortia* Moq. (1 species), and *Ullucus* Caldas (1 species). Although his study concentrated on *Ullucus tuberosus* Caldas, Sperling's dissertation has keys, descriptions, distribution maps, and

<sup>1</sup> Deceased 20 May 1995.

discussions for the remaining eighteen species. His revision of Basellaceae as a family is the first since 1849, when it was treated by Moquin-Tandon. Spelling's discussions of relationships among genera and species provided new information that was integrated with the pollen data (Nowicke, in press). It is unfortunate that his dissertation has not been published in its entirety.

The species are taken up in the same sequence as they are in the dissertation. Abbreviations for authors follow Brummitt & Powell (1992).

*Anredera* Juss.

**ANREDERA FLORIBUNDA** (Moq.) Sperling, *comb. nov.* BASIONYM: *Boussingaultia floribunda* Moq. in DC., *Prodr.* 13(2):229. 1849. TYPE: COLOMBIA. Ibaque, *Goudot s.n.* (HOLOTYPE: P, F-fragment!; Photo: GH!).

**ANREDERA DENSIFLORA** Sperling, *spec. nov.* TYPE: PERU. Lima, San Buenaventura, 2700-2800 m, 17 June 1925, *Pennell 14508* (HOLOTYPE: F!; Isotypes: GH!, NY!).

Folia ovata vel depresso-ovata, 4.0-7.7 cm longa, 2.0-9.5 cm lata, base cordata vel reniformia, apice acuta (foliis ovatis) vel rotundata (foliis depresso-ovatis). Inflorescentia terminales aut laterales, fasciculato-racemosae, inflorescentibus axillaribus pedunculo plerumque robusto portatis. Bractae subter pedicellum triangulares, 1.1-1.8 mm longae, 0.5-0.8 mm latae, persistentes; bractae pedicellorum depresso-ovatae vel perdepresso-ovatae, 1.0-1.2 mm longae, 0.5-0.8 mm latae, persistentes. Sepala late ovata vel latissime ovata, alburnea vel alba, siccitate atrobrunnea. Petala obovata vel elliptica, 1.9-2.6 mm long, 1.0-1.3 mm lata, alburnea vel alba, siccitate atrobrunnea, petaliis interioribus tribus tenuioribus quam petaliis exterioribus duobus, fructu ad maturitatem includentibus. Ovarium globosum; stylus singularis, 0.8-1.2 mm longus; stigma obscure trilobatum.

Distribution. Southern Ecuador to southern Perú. 2100-2800 (3900) m.

ADDITIONAL SPECIMENS EXAMINED. ECUADOR. Azuay: Between Molleturo and Toreador, 2590-3900 m, 14 June 1943, *Steyermark 53002* (NY). Loja: Loja, 2200 m, 15 April 1946, *Espinosa 137* (NY).

PERU. Lambayeque: Prov. Lambayeque, Abra de Porculla, 45 km E of Olmos on the road to Pucara, 1920 m, 13 July 1986, *Plowman et al. 14290* (F). Cajamarca: Prov. Cajabamba, Nunubabamba[?], 2600 m, 13 Aug. 1985, *Mostacero & Guerra 0059* (F). Huanuco: San Rafael, 8500 ft., 4 April 1923, *Macbride 3143* (F); Acomayo, 2100 m, 24 April 1946, *Woytkowski 34245* (F,G,MO,UC,USM). Junin: Paucartambo, 2800 m, 23 July 1969, *Woytkowski 6719* (GH,MO).

*Anredera densiflora* can be recognized by the dense inflorescence and flowers in which the sepals and outer two petals spread in fruit. It is similar to *A. baselloides* Baill. but differs by the ovate leaves, flared petiole, dense inflorescence, smaller flowers, broader sepals, and trilobed stigma (not divided). This species lacks



mammillose cells at the sepal base but does form a very low keel due to contraction of the sepal during drying as in *A. baselloides*.

**ANREDERA TUCUMANENSIS** (Lillo & Hauman) Sperling, *comb. nov.* BASIONYM: *Boussingaultia tucumanensis* Lillo & Hauman, *Anales Mus. Nac. Buenos Aires* 33:353. 1925. (Hauman & Irigoyen, *Anales Mus. Nac. Buenos Aires* 32:159, 449. 1923, *nom. nud.*). LECTOTYPE (here chosen): BOLIVIA: Prov. of Larecaja, Sorata, between Cochipata and Milipaya along the Ulcumarini River, 3200 m, March-May 1858, *Mandon 1028* (LECTOTYPE: K!; Isolectotypes: BM!, F!, G!, GH!, K!, NY!, P; Photos: F!, GH!, MO! of G). SYNTYPE: ARGENTINA: Prov. of Tucuman, Sierra de Garabatal, 2000 m, 22 March 1922, *Schreiter s.n.* (LIL).

**ANREDERA KRAPOVICKASII** (Villa) Sperling, *comb. nov.* BASIONYM: *Boussingaultia krapovickasii* Villa, *Lilloa* 32:305, fig. p. 306. 1966. TYPE: ARGENTINA: Salta, km 28, road between Salta and Jujuy, 31 Jan. 1947, *C.A. O'Donell 4723* (HOLOTYPE: LIL).

**ANREDERA BRACHYSTACHYS** (Moq.) Sperling, *comb. nov.* BASIONYM: *Tandonia brachystachys* Moq. in DC., *Prodr.* 13(2):227. 1849. LECTOTYPE (here chosen): COLOMBIA. Bogota, *Goudot 1* (P-Herb. Moq., det. by Moq.; Photo: GH!). SYNTYPE: ECUADOR. west side of Pichincha, 8500 ft., [without collector] (K!, P-fragment ex. Herb. Hook.; photo GH!).

**ANREDERA ASPERA** Sperling, *spec. nov.* TYPE: BOLIVIA. Prov. La Paz, Dept. Larecaja, Sorata, 68° 40' W 15° 45' S, 2530 m, 8 Dec. 1981, *Sperling & King 5412* (HOLOTYPE: GH!; Isotype: LPB!, others not distributed).

Planta scandens vix volubilis succulenta mucliaginaeque. Caules rubelli asperi praesertim ad nodos. Folia obovata, 2.1-4.2 cm longae, 1.4-2.0 cm latae, base cuneata vel acuta, apice obtusa vel rotundata. Inflorescentia laterales racemosae simplices aut base unifurcatae, pedicellis minutis, 0.5-0.7 mm longis. Bracteae subter pedicellum deltatae, 0.9-1.0 mm longae?, 0.8 mm latae?, adnatae decursivaeque; bracteae pedicellorum rhombicae vel perdepresse trullatae, 0.7-0.9 mm longae?, 0.8-1.0 mm latae, apice acutae, base truncatae, lobis lateralibus sagittiformibus, adnatae decursivaeque. Sepala perdepresse-ovata, 2.0-2.4 mm longa, 2.3-2.4 mm lata, apice acuta, viridulo-alba, erecta et per anthesin patentia. Petala obovata, 3 mm longa, 1.5-1.6 mm lata, alba, erecta et per anthesin urceolata. Ovarium globosum vel obovoideum; stylus singularis, 1 mm longus, super basin ad stigma expansus; stigma obscure trilobatum capitatum. Fructus adhuc ignoti.

Distribution. Known only from the type collection in northern Bolivia.

*Anredera aspera* can readily be distinguished by its asperous stem and greatly flared style. The flowers are nearly sessile but upon close inspection the very short pedicel is evident. The flowers are erect at anthesis and not spreading like many species of *Anredera*. The pedicellar bracts are decurrent down the pedicel and continuous with it, forming a cuplet on which the flower is borne.

This species is similar to *Anredera marginata*, from which it differs in having always obovate leaves (even in the flowering portion of the stem), nearly sessile flowers that are slightly larger than *A. marginata*, and flared styles.

Unlike most species of *Anredera* this plant is scarcely twining, a character which is constant when the plant is cultivated in the greenhouse. In the greenhouse it is more difficult to propagate, being much slower in forming adventitious roots from cuttings than any other species of *Anredera*.

The species was collected growing alongside *Anredera ramosa* (Moq.) Eliasson and in the same general area where the type specimen of *A. tucumanensis* was collected by Mandon. The type collection was observed being visited by flies, which are the presumed pollinators.

One collection from Bolivia may be this species: BOLIVIA. near La Paz, 10,000 ft., Oct. 1885, *Rusby 2570* (NY two sheets, F). It has a similar pedicel and pedicellar bracts, but the leaves are lacking. Fruits are present in this specimen (enclosed in the nigrescent perianth); because the type collection lacks fruits a comparison can not be made. The petals of the Rusby collection are slightly smaller, and most of the flowers on the sheets are in poor condition.

#### ACKNOWLEDGMENTS

I thank David Lellinger for editing the two Latin descriptions and reviewing the paper, and Dan Nicolson for his review and suggestions.

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**STEVIA CALZADANA (ASTERACEAE) A NEW SPECIES FROM OAXACA,  
MEXICO**

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ABSTRACT

*Stevia calzadana* B.L. Turner, *spec. nov.*, is described and illustrated from Oaxaca, (Mpio. Coicoyan de las Flores), México. It belongs to the series *Corymbosae* of *Stevia* where it relates to *S. jorullensis*, distinguished from the latter by its linear-lanceolate, glandular-punctate leaves and achenes with aristate pappus scales.

KEY WORDS: Asteraceae, Eupatorieae, systematics, *Stevia*, México

Routine identification of Mexican composites (Asteraceae) has revealed the following novelty.

**STEVIA CALZADANA** B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Mpio. Coicoyan de las Flores, Distr. Santiago Juxtlahuaca, El Arenal, 4 km de Coicoyan de las Flores, carretera a San Martin Peras - Santiago Juxtlahuaca (17° 17' N × 98° 15' W), 1775-1890 m, 20 Nov 1994, J.I. Calzada 19539 (HOLOTYPE: TEX).

*S. jorullensis* H.B.K. similis sed foliis linearibus-oblongatis (vs. ovatis), glanduliferis-punctatis (vs. non glanduliferis-punctatis); et pappis acheniorum aristatis (vs. coroniformibus).



Fig. 1 *Stevia calzadana*, from holotype.



Stiffly erect, mostly unbranched, perennial herbs ca. 1 m high. Stems reddish, vestiture puberulent with minute upcurved hairs ca. 0.2 mm high. Leaves opposite throughout, gradually reduced upwards; petioles 1-3 mm long. Midstem leaves linear-oblongate, 5.0-6.5 cm long, 5-6 mm wide, glabrous throughout, abundantly glandular-punctate, especially beneath, 1-nervate or weakly 3-nervate, the margins entire. Heads arranged in both terminal and axillary, mostly congested, flat-topped cymules 4-10 cm across, the ultimate peduncles mostly 1-5 mm long. Involucres cylindric, 5-6 mm long, the bracts sparsely puberulent to nearly glabrate, their apices acute. Corollas (dried) deep rose-colored, 6-9 mm long, the tube and throat indistinct, glabrous or nearly so, the lobes 1-2 mm long, glabrous without. Achenes with body 3.0-3.5 mm long, minutely hispidulous, the pappus of 3 linear aristate scales ca. 5 mm long, the upper portion barbellate for 1-2 mm, below these a crown of 3 or more united scales ca. 0.5 mm high.

This species is distinguished by its linear-oblongate leaves which are essentially glabrous, and 3-aristate achenes. In Grashoff's unpublished doctoral thesis (Univ. of Texas, Austin, 1972) the species will key to or near *Stevia jorullensis* H.B.K., but it differs from the latter in both leaf shape (linear-oblongate vs. ovate) texture (densely glandular-punctate beneath vs. not so), and pappus aristate (vs. coroniform, without aristae).

It is a pleasure to name this distinctive *Stevia* for J.I. Calzada, extraordinary collector of Mexican plants, now associated with UNAM on the flora of the Mixteca Alta region of Oaxaca.

#### ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and Piero Delprete and Mark Mayfield for reviewing the manuscript. The illustration was drawn by Ms. Maria Thompson.

**MENODORA GYPSOPHILA (OLEACEAE), A NEW SPECIES FROM NEAR  
GALEANA, NUEVO LEÓN, MEXICO.**

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ABSTRACT

A new species, *Menodora gypsophila* B.L. Turner, is described from gypseous soils near Galeana, Nuevo León, México. It is closely related to the widespread *M. coulteri* but differs by a number of characters, including leaf-shape, venation, vestiture, and substrate preference.

KEY WORDS: Oleaceae, *Menodora*, systematics, México

Routine identification of plants from northeastern México has revealed the following novelty.

**MENODORA GYPSOPHILA** B.L. Turner, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Galeana, Santa Rosa, arid hillside, 1610 m, 6 Oct 1995, *Hinton et al.* 25643 (HOLOTYPE: TEX).

*M. coulteri* A. Gray similis differt foliis crassis, pro parte maxima triplinerviis et apiculatis, et caulibus moderate pubescentibus et hirsutis, pilis 0.2-0.3 mm longis (vs. pilis deorsum curvatis et 0.1-0.2 mm longis).

Low much-branched shrublets 10-20 cm high. Stems terete, moderately pubescent with widely spreading hairs mostly 0.2-0.3 mm long. Leaves opposite throughout, gradually reduced upwards, those at midstem lanceolate-elliptic, markedly thickened, bearing 3 raised nerves on the lower surface, pubescent like the stem, entire, the apices apiculate, the blades mostly 5-15 mm long, 4-6 mm wide. Flowers terminal, the pedicels reflexed in fruit. Calices 3-6 mm long; lobes 8-13, 2-4 mm long, linear-lanceolate, pubescent with spreading hairs. Corollas bright yellow; tubes 2-4 mm long; lobes 5-10 mm long, 3-6 mm wide. Anthers yellow, exserted 2-4 mm from the tube. Style exserted 3-5 mm from the tube. Paired capsules ovoid, reflexed, each ca. 5 mm across; seeds obovoid, ca. 4 mm long, 2 mm across, the outer surface spongy and irregularly patterned.

ADDITIONAL COLLECTIONS EXAMINED: MEXICO. Nuevo León: Mpio. Galeana, 5 km from Galeana, along the road to Rayones, 1600 m, 27 Jun 1994,

*Hinton et al.* 24474 (TEX); 3 km N of Galeana on rather bare gypseous-calcareous (?) soils, 26 Jul 1993, *Turner 93-158* (TEX).

Collections of this species were unknown to me at the time of my treatment of *Menodora* for North America (Phytologia 71:340-356. 1991.). As indicated by the specimens cited above, this taxon was first collected by myself in 1993 (along with several close-up photographs). The two subsequent collections were made by Jaime and George Hinton in about the same area, apparently also in gypseous soils. I have selected *Hinton 25643* as the type of this species because the collections concerned possess relatively large well-developed leaves and bountiful flowers. The other two collections are not as lush and possess leaves about half the size of the type, with decidedly smaller flowers, especially *Turner 93-158* which has very small calyces (3-4 mm long) with only ca. 8 lobes (vs. ca. 13 in the type). In most other details, however, the paratypes are like those of the holotype. When originally collected I thought that *M. gypsophila* might be an aberrant specimen of *M. coulteri*, the latter having thinner, largely enervate leaves and a finer, down-curved stem-pubescent. The additional Hinton collections have convinced me that the populations concerned deserve a name. I am especially grateful to George Hinton's perceptive eye who sent me the most recent collection with the observation (pers. letter) that "the leaves have clear venations that are unlike any in our collections, and I couldn't match it to any in your revision of the genus", which is so, hence the description here.

#### ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to Piero Delprete and Mark Mayfield for reviewing the paper.

## A NEW COMBINATION IN *PHYSALIS* (SOLANACEAE)

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### ABSTRACT

*Margaranthus solanaceus* is transferred to the genus *Physalis* and hence the monotypic genus *Margaranthus* becomes a synonym of *Physalis*.

KEY WORDS: *Physalis*, *Margaranthus*, Solanaceae, systematics

*Margaranthus* Schldl. (Solanaceae) is a monotypic genus from México and the southwestern United States. It was described by Schlechtendal 1838. It has always been regarded as very closely related to the genus *Physalis* L., differing in form and colour of the corolla and insertion of filaments. The annual *M. solanaceus* Schlechtendal has an urceolate, violet/greenish corolla with adnate filaments while in *Physalis* the corollas are campanulate to nearly rotate, yellow or whitish and the filaments are free.

In his monograph, Rydberg (1896) considered *Margaranthus* as very closely related to *Physalis* but kept it as a separate genus. In a karyological report, Menzel (1950) noted the great similarities between *Margaranthus* and *Physalis* and, based on S/T ratio data placed *Margaranthus* between the annual sections *Angulatae* and *Pubescentes* of *Physalis*. She did not, however, make any formal transference. Waterfall (1958) in his survey of *Physalis* in North America commented on the similarity of *Margaranthus* to *Physalis* and noted that if not in flower, *Margaranthus* could not be distinguished from small-fruited species of *Physalis*. He stated that possibly *Margaranthus* should be included in *Physalis*, but that further studies including critical species of *Chamaesaracha* (*C. grandiflora* (Hook.) Fern., *C. nana* (A. Gray) A. Gray, both now in *Leucophysalis*) were needed before formal transference. He thus kept *Margaranthus* as it was originally described, as a genus of its own. On the other hand he included *Quincula lobata*, another related, monotypic genus in *Physalis*, even though *Quincula* differs from *Physalis* in several characters besides colour of corolla. This was probably due to *Quincula* originally being described as a *Physalis*.

My recent cladistic analyses of the physaloid group, including among others *Margaranthus*, *Quincula*, *Chamaesaracha*, and *Leucophysalis* (Axelius 1995) has

shown that *Margaranthus* is well nested within the *Physalis* clade (including *P. pubescens* L., *P. angulata* L., and *P. peruviana* L.), close to *P. pubescens* (Axelius 1995, fig. 1). The species of *Chamaesaracha*, *Quincula*, and *Leucophysalis* are more distantly related and found clearly outside the *Physalis* clade. The species of *Chamaesaracha* group together and form a very strongly supported sister-relation with *Quincula*. There is thus a rather strong support for the hypothesis that *Margaranthus* has originated from an ancestor within the core *Physalis*. This view is also in accordance with analysis based on molecular data (Martínez 1993). Hence *Margaranthus* cannot be kept separated from *Physalis* without splitting the core of this genus into smaller monophyletic entities. *Physalis* is a large genus which lacks a modern revision and it's circumscription might be questioned in many ways but to keep *Margaranthus* separated under these circumstances, can not longer be justified.

**PHYSALIS SOLANACEOUS** (Schlechtendal) Axelius, *comb. nov.*  
 BASIONYM: *Margaranthus solanaceus* Schlechtendal, Index Sem. Hort. Hal. 1838 Coll. 8. 1838. TYPE: Cult. in Horto Botanico Halensis 1838, "e seminis in Mexico locis calidioribus coll. C. Ehrenberg". D.F.L. Schlechtendal s.n. (HOLOTYPE: HAL).

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TAXONOMIC OVERVIEW OF *HEDYOTIS NIGRICANS* (RUBIACEAE) AND  
CLOSELY ALLIED TAXA

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ABSTRACT

A taxonomic study of *Hedyotis nigricans* is rendered in which a widespread var. *nigricans* is recognized, along with five regional or localized, allopatric varieties: var. *floridana* (southern Florida); var. *pulvinata* (northeastern Florida); var. *austrotexana* B.L. Turner, var. nov. (southern Texas); var. *gypsophila* B.L. Turner, var. nov. (montane regions of Nuevo León, México and closely adjacent states); and var. *papillacea* B.L. Turner, var. nov. (northern panhandle and trans-Pecos, Texas, and closely adjacent New Mexico). A key to these taxa is provided along with maps showing their distributions. Additionally, these taxa are compared with the closely related species *H. angulata* and *H. butterwickiae*, and maps showing their distribution are also provided.

KEY WORDS: Rubiaceae, *Hedyotis*, *Houstonia*, systematics, Mexico, Texas

*Hedyotis nigricans* (Lam.) Fosberg (= *Houstonia nigricans* [Lam.] Fern.) has been variously treated as belonging to the genus *Hedyotis* or *Houstonia* (Shinners 1949; Terrell 1986, 1991), some workers preferring an inclusive *Hedyotis* (including *Houstonia*), others preferring a more restricted *Hedyotis* (excluding *Houstonia*, cf. Terrell 1991). Most current workers accept *Hedyotis nigricans* as belonging to *Hedyotis*, including Terrell (1991), albeit tentatively. Terrell (1986) provided a taxonomic overview of *H. nigricans* for the U.S.A., especially Florida, but did not treat in detail collections from Texas, New Mexico, and México.

The present contribution is based upon the detailed examination of over 800 sheets of *Hedyotis nigricans* on file at LL, TEX, and SRSC.

Key to Texas populations of *Hedyotis nigricans* and closely related taxa

1. Leaves mostly basal, very numerous and forming pulvinate mats, the stiffly erect rather naked stems having markedly appressed, stiff-lanceolate leaves; fruits mostly orbicular; southeastern most Brewster Co. .... *H. butterwickiae*

1. Leaves otherwise, mostly cauline and spreading; fruits mostly ovoid (except for Gulf Coastal populations); widespread.....(2)
2. Midstem leaves thick and short, ovate-linear to lanceolate, 1 cm long or less, the margins never enrolled; capsules orbicular at maturity; calyx lobes 1 mm long or less; rock or cliff-dwelling species of eastern trans-Pecos, Texas and closely adjacent México.....*H. angulata* Fosberg
2. Midstem leaves not as described in the above, the margins to some extent enrolling with dessication; capsules ovoid at maturity; calyx lobes mostly 1 mm or more long, if shorter then the leaves decidedly linear to linear-oblancoelate; mostly not rock or bare-bluff species, widespread (*H. nigricans*). ....(3)
3. Calyx, and/or upper stems and leaves to some extent papillose with extended epidermal cells, these superficially resembling hairs, or else the calyx to some extent beset with callose hair-like enations.....(4)
3. Calyx, upper stems and leaves glabrous or merely ciliate along the leaf margins and calyx lobes.....var. *nigricans*
4. Plants mostly sprawling, low bushy herbs 5-15 cm high; panhandle and trans-Pecos Texas.....var. *papillacea*
4. Plants mostly simple-stemmed, non bushy herbs 20-40 cm high; southern Texas.....var. *austrotexana*

#### Key to Mexican populations of *Hedyotis nigricans*

1. Primary leaves at midstem mostly 1-3 mm wide, 3-12 times as long as wide; calyx usually glabrous, or with but a few ciliate hairs; mostly calcareous soils, widespread.....var. *nigricans*
1. Primary leaves at midstem mostly 3-6 mm wide, 2.5-3.5 times as long as wide; calyx usually markedly setose with thickened hairs; mostly gypseous soils of southernmost Coahuila, Nuevo León, and very closely adjacent Zacatecas and probably Tamaulipas. ....var. *gypsophila*

*HEDYOTIS BUTTERWICKIAE* (Terrell) Nesom, Syst. Bot. 13:434. 1988.

*Houstonia butterwickiae* Terrell

This species, first described by Terrell in 1979, was retained by both Nesom (1988) and Terrell (1991). It is known only by collections from along the ridgetop of the Bullis Range on the Bullis Gap Ranch, in Brewster Co., which is about 20 mi S of Sanderson (Terrell Co.). The taxon is obviously closely related to *Hedyotis nigricans* but can be immediately recognized by its very narrow, linear-lanceolate, relatively thickened stiffly ascending stem leaves, the basal leaves forming a dense pulvinate array of shorter, somewhat broader elliptic-lanceolate leaves. Additionally, Terrell, in his original description, notes that the taxon has nearly globose capsules and a relatively diffuse inflorescence.

*HEDYOTIS NIGRICANS* (Lam.) Fosberg, Lloydia 4:287. 1941.

Terrell (1986) treated this taxon as belonging to the genus *Houstonia* but subsequently (1991) positioned it in *Hedyotis*. He considered *H. nigricans* to be a "polymorphic species", but nevertheless recognized three varieties in the complex, a

widespread highly variable var. *nigricans*, and two very localized varieties in Florida, both coastal (Figure 1).

I have examined numerous sheets of this species from over a broad region and recognize three additional varietal taxa, as described below. All of these are largely allopatric with var. *nigricans* but appear to intergrade into the latter in regions of near contact.

Even with the removal of these several newly described elements, var. *nigricans* remains quite variable, ranging from rather spindly plants with linear to linear-oblongate leaves in eastern and central Texas, to shorter plants with linear-lanceolate to linear-elliptic leaves in west-central Texas and westwards. In México the variety, while quite variable, is less complex, as shown in Figure 2.

#### *HEDYOTIS NIGRICANS* var. *NIGRICANS*

Terrell (1986, 1991) accounted for most of the Texas names involved in the synonymy of this variety, and these are briefly touched upon here.

*Houstonia salina* A.A. Heller -This name is typified by material from coastal areas of southern Texas (Nueces Co.). I agree with Terrell (1986) that the plants concerned differ but little from typical elements of var. *nigricans*.

*Houstonia tenuis* Small -This name is typified by material from central Texas (San Saba Co.) and appears to be the same as var. *nigricans*, as noted by Terrell (1991).

*Houstonia angustifolia* Michx. var. *rigidiuscula* A Gray, Syn. Fl. N. Amer. 1(2):27. 1884. Shinnars (1949) transferred this variety into *Hedyotis nigricans* without comment, merely noting it to be typified by plants collected in "S. and W. Texas, Palmer, Havard, & c. Coast of E. Florida, Rugel. (Mex)". Unfortunately, to my knowledge, no one has lectotypified the name concerned, but my own evaluations of this appellation are that it was meant to apply to plants having a low rigid stature, mainly occurring in the southwestern U.S.A. (western Texas, New Mexico, and Arizona) and México. Those who might wish to apply this varietal name to such plants over this region might do so, but I view the variation between such habital forms as relatively trivial, there being gradual intergradation between such populational forms over a broad region of central Texas and northern México. In short, there seems little merit in attempting to define what the habital limits of var. *rigidiuscula* might be.

*Houstonia angustifolia* Michx. var. *scabra* S. Wats., Proc. Amer. Acad. Arts 18:97. 1883. (TYPE: MEXICO. Coahuila: Carocol Mts, 19-20 Aug 1880, *E. Palmer* 410; Isotype: LL!). -This name is unaccounted for by Terrell (1986, 1991) but examination of type material shows this to belong to var. *nigricans*. The Carocol Mts are said to be located about 24 mi southeast of Monclova, México (McVaugh 1956), an area well within the distribution of var. *nigricans* as defined in the present treatment.

**HEDYOTIS NIGRICANS** (Lam.) Fosberg var. **AUSTROTEXANA** B.L. Turner, var. nov. TYPE: U.S.A. Texas: Karnes Co., roadside 2 mi E of El Tejano Cafe, "dry sandy, clay soil", 22 Jun 1952, *Joe C. Johnson* 833 (LL).

*H. nigricans* (Lam.) Fosberg var. *austrotexana* B.L. Turner, var. nov.; similis *H. nigricans* var. *nigricans* sed calyces maturi valde papillosoi ubique.

Resembling var. *nigricans* but the mature calyces markedly papillose throughout.

Other than having markedly papillose calyces, this taxon is essentially the same as var. *nigricans*; indeed, it apparently replaces the latter in the region shown in Figure 1. The two varieties do, however, grow in close proximity and occasional plants appear to show intergradation of the calyx character concerned in regions of near contact (e.g. Goliad Co.: *Smith* 4271; San Patricio Co.: *Turner* 80-91M).

**HEDYOTIS NIGRICANS** (Lam.) Fosberg var. **GYPHOPHILA** B.L. Turner, var. nov. TYPE: MEXICO. Nuevo León: Santa Rita, 2370 m, "Sparse pine woods - gypsum hillsides," 11 Jun 1981, *Hinton et al.* 18278 (HOLOTYPE: TEX).

*H. nigricans* (Lam.) Fosberg var. *gypsophila* B.L. Turner, var. nov.; similis *H. nigricans* var. *nigricans* sed plantae parviores et ramosissimi e basi; folia ovato-elliptica et saepius 2.5-3.5 plo longiores quam latiores (vice folia linearia-lanceolata usque linearia-oblancoolata et saepius 4-20 plo longiora quam latiora); calyces maturi plerumque hispidi enatis capillaribus et latis basi (vice calyces glabros enatis infirme evolutis).

Resembling var. *nigricans* but the plants low and much-branched from the base, the leaves elliptic-ovate and mostly 2.5-3.5(4.0) times as long as wide (vs. linear-lanceolate to linear-oblancoolate, mostly 4-20 times as long as wide) and the mature calyces usually markedly hispid with broad-based hairs (vs. glabrous or merely minutely setose).

This taxon is represented by 45 or more collections at LL, TEX, mostly obtained from gypseous soils in the state of Nuevo León. While quite variable as concerns calyx pubescence, the branching habit and leaf shape is very diagnostic, and in combination the characters are as distinctive for recognition purposes as those characters in combination used by, for example, Terrell in his recognition of *Hedyotis nigricans* var. *pulvinata* (Small) Fosb., the latter superficially resembling var. *gypsophila* as conceived here.

**HEDYOTIS NIGRICANS** (Lam.) Fosberg var. **PAPILLACEA** B.L. Turner, var. nov. TYPE: U.S.A. New Mexico: Otero Co., northern McKittinck Canyon at first crossing of Texas-New Mexico boundary on the New Mexico side, "gravels and boulders of stream bottom. In Riparian type habitat and below protected cliffs; Big tooth maple, Ponderosa Pine, Madrone", etc. 8 Oct 1973, *Thomas F. Patterson* 508 (HOLOTYPE: LL).

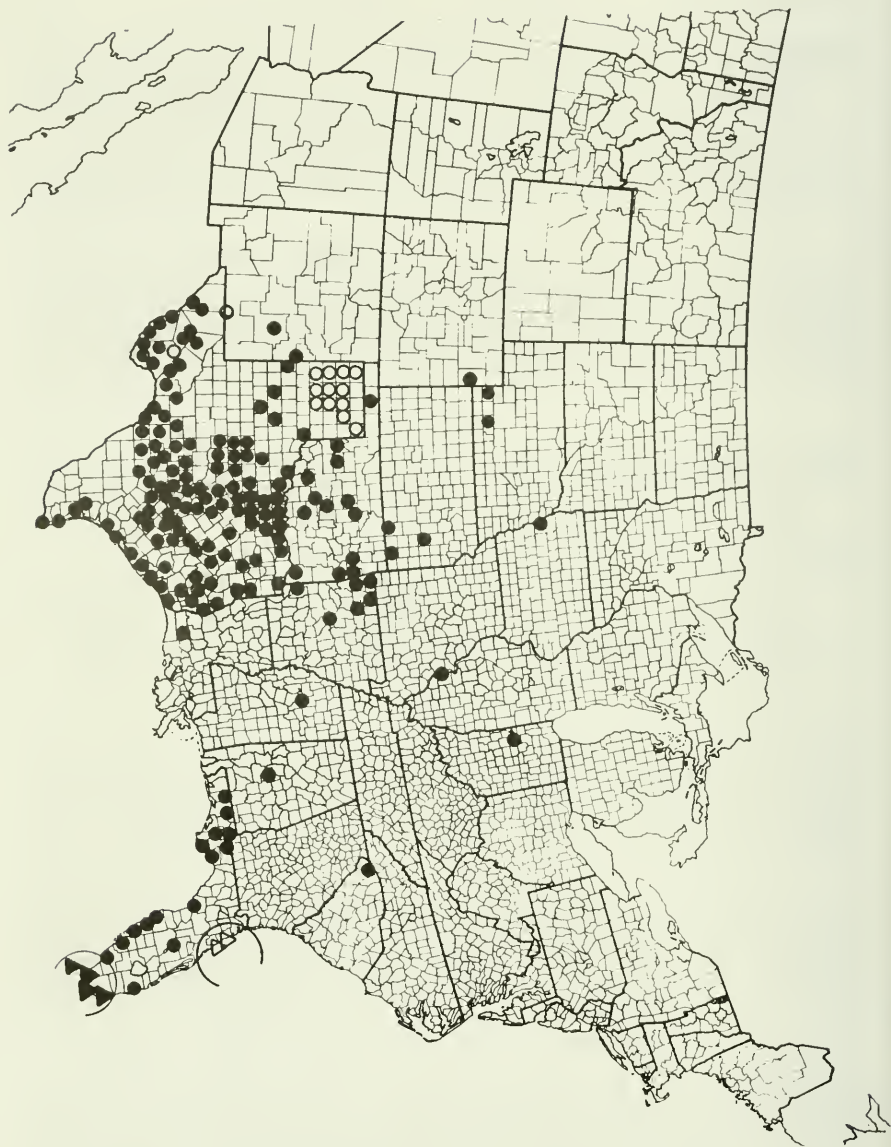


Figure 1. Distribution of *Hedyotis nigricans* in U.S.A.: var. *nigricans* (closed circles); var. *austrotexana* (diagonals); var. *floridana* (closed triangles); var. *papillacea* (open circles); var. *pulvinata* (open triangles).



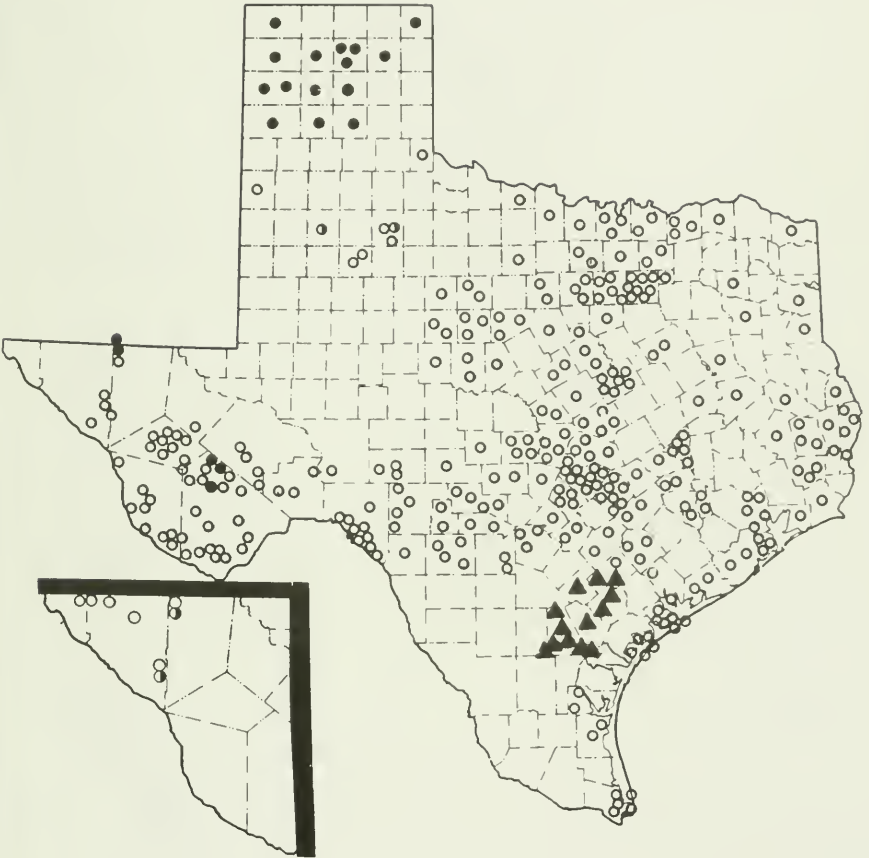


Figure 2. Distribution of *Hedyotis nigricans* complex in Texas: *var. nigricans* (open circles); *var. papillacea* (closed circles);  $\pm$  intermediates to *var. nigricans* and *var. papillacea* (half circles); *var. austrotexana* (triangles).

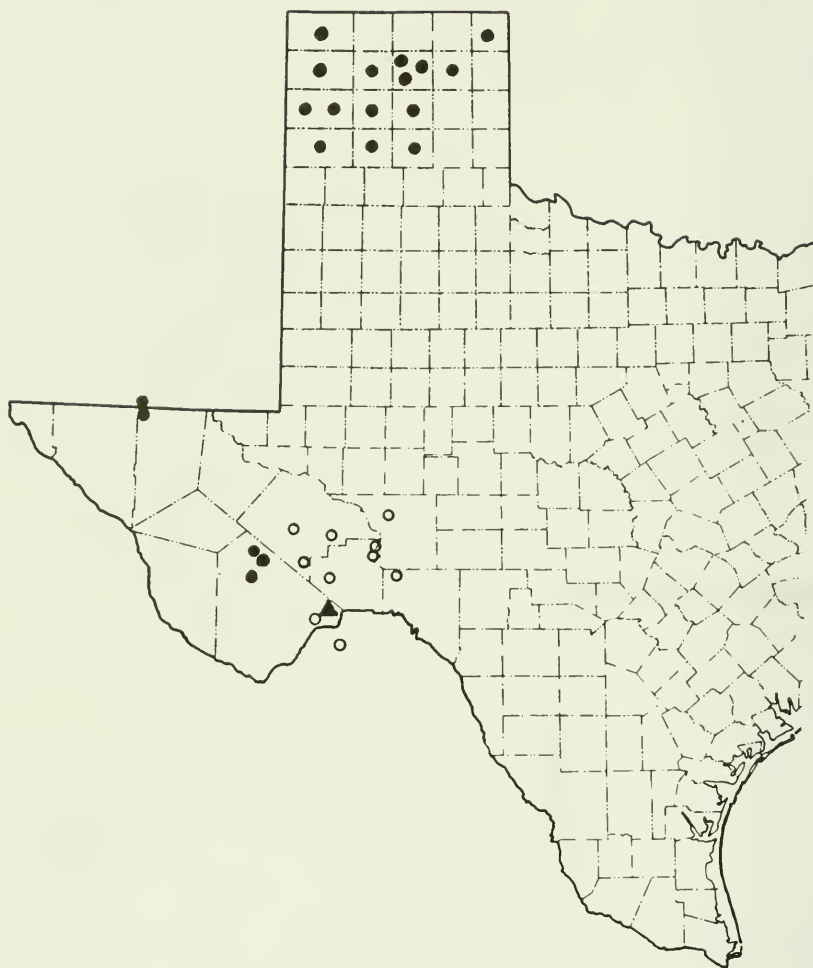


Figure 3. Distribution of *Hedyotis angulata* (open circles) and the superficially similar *H. uigrans* var. *papillacea* (closed circles); *H. butterwickiae* (triangle).



Figure 4. Distribution of *Hedyotis nigricans* in México; var. *nigricans* (open circles); var. *gypsophila* (closed circles); intermediates (half circles).

*H. nigricans* (Lam.) Fosberg var. *papillacea* B.L. Turner, var. nov.; similis *H. nigricans* var. *nigricans* sed saepius 5-15 cm alta, enascens caudicibus ramosis et ligneis; caules, folia, calycesque aliquantum papilloso enatis capillaribus.

Resembling var. *nigricans* but the plants mostly 5-15 cm high and the stems, leaves and calyces to some extent papillose with hair-like enations.

As shown in Figure 1, the var. *papillacea* is largely confined to the northernmost panhandle region of Texas where it passes, rather abruptly, into var. *nigricans*. It also is found in the trans-Pecos regions of Texas and closely adjacent New Mexico where it reportedly occurs in and along limestone ledges and bluffs (Del Norte, Glass and Guadalupe Mts). Plants of the latter region superficially resemble *Hedyotis angulata*, and some of these were annotated as such by Terrell (e.g., Warnock 7978, from the Del Norte Mts [TEX]). Inclusion of the panhandle collections with the trans-Pecos material might appear moot in that the panhandle collections have somewhat longer, more linear-lanceolate leaves and occur as populational disjuncts. However, similar populational disjunctions occur in several species of Asteraceae (e.g., *Chrysanthamnus*) and need not be cause for much concern, at least I find it difficult to distinguish between the two populational elements.

It should be noted that the type collection of var. *papillacea* was found growing with or near material that might be deemed to be var. *nigricans* (Patterson 508, 516) in that these two relatively late-flowering collections seemingly lack the papillose enations which characterize the taxon, but in all other characters these two plants resemble var. *papillacea* as conceived here. The same is true for occasional specimens from the panhandle region, where the variety is apparently much more common, to judge from herbarium collections.

Finally, it should be emphasized that from among the 1000 or more specimens of var. *nigricans* examined by me in the present study, only a few sheets were discerned to have papillose enations of the type found in var. *papillacea*, at least two of these from the state of Florida (Franklin Co., sand dunes and coastal areas along the Gulf of Mexico: Henderson 63-1309; Kral 39899). Obviously such enations are under relatively simple genetic control, but in the var. *papillacea* these appear to be populationally "fixed" in the regions shown in Figure 1, occurring on plants with a habital display quite different from the habital display of var. *nigricans* over most of its eastern distribution.

#### ACKNOWLEDGMENTS

I am grateful to my wife, Gayle, for the Latin diagnoses, and to her and Piero Delprete for reviewing the manuscript.

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## THE STATUS OF *QUERCUS ARKANSANA* SARG. (FAGACEAE) IN TEXAS

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### ABSTRACT

The status of *Quercus arkansana* Sarg. in Texas is discussed. It is known to occur in Cass County, and there is an historical record for Jasper County.

KEY WORDS: *Quercus arkansana*, Texas, Fagaceae, phytogeography

*Quercus arkansana* Sarg., an uncommon Coastal Plain oak with scattered populations ranging from southwestern Georgia and northwestern Florida to southwestern Arkansas and northwestern Louisiana, has not been known for Texas (Bill Carr, Texas Natural Heritage Program, pers. comm.; Correll & Johnston 1970; Johnston 1990; Stanley D. Jones, Botanical Research Center (BRCH), pers. comm.; Hunt 1986; Little 1977; Nixon 1985; Sargent 1965; Simpson 1988; Vines 1977). Hunt (1990) lists the species as occurring in Texas on the basis of an historical specimen collected in 1903 in Jasper County (*W.W. Ashe 1* [NCU]). More recently, two small populations of *Q. arkansana* have been found in Cass County.

In 1990, Hunt (*Hunt TX218* [to be distributed to TEX and ND]) first confirmed *Quercus arkansana* from Texas, identifying it as "*Q. arkansana* tending toward *Q. nigra*." This collection, representing one sapling, was from the south side of TX 77, 1 km west of the Louisiana state line in sandy loam pine-oak woods dominated by *Pinus echinata* P. Mill., *Quercus falcata* Michx., *Q. nigra* L., and *Liquidambar styraciflua* L. This find was the result of searches stimulated by the presence of a large population in Louisiana about 3 km away, documented initially by G.H. Ware (*Ware 1492* [DAV]) in 1965 (Hunt 1990).

In 1995, the MacRobertses found several small trees (up to 7 meters high) in a young, densely stocked, even-aged pine plantation on deep sandy soils along a 1 km

stretch of Cass County Road 4561 about 5 km northeast of McLeod, Texas, and 5 km west of Rodessa, Louisiana, which they identified as *Quercus arkansana* (MacRoberts & MacRoberts 2875 [NCSC], 2874, 2877 [BRCH], 2879 [VDB], 2881 [LSUS], 2873 [ND], 2878 [DAV]). Some of these specimens were sent elsewhere for confirmation. Hunt determined 2876 as "probably *Quercus arkansana*  $\times$  *Q. nigra*," 2875 and 2873 were identified as *Q. arkansana* by J.W. Hardin and Richard Jensen, respectively. Julia Larke determined an unnumbered specimen to be *Q. arkansana*. This population is within 2 km of a large population of *Q. arkansana* in Louisiana centering on a point where Black Bayou and State Line Creek cross LA 168 about 3 km west of Rodessa (Teague & Wendt 1994). Associated species for this site include *Quercus marilandica* Muenchh., *Q. stellata* Wang., *Q. incana* Bartr., *Pinus taeda* L., *P. echinata*, *Vitis* spp., *Sassafras albidum* (Nutt.) Nees, and *Liquidambar styraciflua*. The area was heavily shaded, had a dense pine litter and almost no herbaceous understory, and was badly damaged by commercial forestry.

The environment of the Cass County sites is typical for the species: midslope of eroding sandhills adjacent to headwater tributaries. That *Quercus arkansana* occurs in Cass County is not surprising since it occurs in adjacent parishes and counties in Louisiana and Arkansas (Hunt 1990; Louisiana Natural Heritage 1995; Smith 1988). Hunt (1986) has documented increased introgression between *Q. arkansana* and *Q. nigra* at the range edge of the former. Thus the mixed traits found in the Cass County collections are expected: short petioles (*Q. nigra*), scurfy leaf and twig pubescence (*Q. arkansana*), and leaf shape varying between the two provide strong evidence for putative hybridization between these species.

In addition to these recent finds, Hunt located a specimen from Jasper County (W.W. Ashe 1 [NCU]) collected in 1903 that is probably *Quercus arkansana* but may be a hybrid between *Q. nigra* and *Q. velutina* Lam. (Hunt 1990). This specimen was originally identified as *Q. velutina*  $\times$  *Q. laurifolia* Michx. Unfortunately, a specific locality is not given and, although much potential mesic sandhill habitat exists in the northern third of the county, relocating this population, if it still exists, may be difficult. The east Texas landscape has been drastically altered over the past century, and *Q. arkansana* is notorious for its patchy distribution and its inconspicuousness, which has always made it difficult to locate (Hunt 1986).

These populations represent westward range extensions for *Quercus arkansana*. Additional populations of this oak are expected and should be sought in Bowie, Marion, and Cass counties. The rarity of this species in Texas and throughout its range makes it a good candidate for any protected plant list for the state, and an effort to protect its habitat should be made to ensure its survival in Texas.

#### ACKNOWLEDGMENTS

Stanley Jones (BRCH) and Bill Carr (Texas Natural Heritage Program) supplied information on the distribution of *Quercus arkansana*. J.W. Hardin (NCSC), Richard Jensen (ND), and Julia Larke (Louisiana Natural Heritage Program), confirmed the MacRoberts' initial identification. Hunt's research was supported by NSF Grant BSR-8414419 to David E. Giannasi and David M. Hunt. Thanks are due to Lon

Hunt and Michael Moore for assistance in the field, and Nancy Coile for handling herbarium loans. Richard Jensen and Stanley Jones reviewed the manuscript.

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## CHROMOSOME NUMBERS REPORT

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### ABSTRACT

A first record of *Muhlenbergia quadridentata* chromosome number is given, a diploid chromosome number for *M. virescens* is reported for the first time, and the tetraploid condition of *M. montana* is confirmed.

### RESUMEN

Se registra por primera vez el número cromosómico de *Muhlenbergia quadridentata*, un número cromosómico diploide para *M. virescens* se reporta por primera vez, y la condición tetraploide de *M. montana* se confirma.

KEY WORDS: *Muhlenbergia*, Poaceae, cytology

### INTRODUCTION

The mostly American genus *Muhlenbergia* Schreber is comprised by two rather distinct groups which had been cytologically studied by several authors. Pohl (1964) studied the broad-leaved, mesic, rhizomatous species from the deciduous forests of eastern North America. While Peterson (1988), did chromosome counts for the group of annuals comprising the xeromorphic caespitose species, distributed in the western plains of America. They both reached the conclusion that the basic number for the genus is  $x = 10$ .

Chromosome counts were completed during a systematic study of the *Muhlenbergia montana* (Nutt.) Hitch. complex (Herrera-A. & Bain 1991; Herrera-Arrieta & Grant 1993, 1994), a group of thirteen perennial, xeromorphic caespitose species. Chromosome counts for three species of the complex were successful and are here reported. Chromosome number for *M. quadridentata* (H.B.K.) Kunth is a first report, the *M. virescens* (H.B.K.) Kunth chromosome count seems to be the first

diploid record of the aneuploid number reported by Reeder (1967), and the *M. montana* tetraploid condition reported by Reeder (1968) is confirmed.

## MATERIAL AND METHODS

Chromosome determinations are based on observations of up to twelve cells from a minimum of five individuals per population, using a phase contrast microscope. Floral buds were field collected in 95 percent ethanol-glacial acetic acid (3:1) prior to fixation and storage under refrigeration in 70% ethanol. To stain: Hydrolyze in 1N HCl at 60°C for 7 to 10 minutes, and stain in Feulgen reagent for 2 hours, rinsed in running tap water for 3 minutes. Slides were prepared in a drop of 45% acetic acid, and squashing the floral buds under a cover slip. The cover slip was temporarily sealed with a paraffin-gum arabic mixture. Attempts to grow the plants from this species complex under greenhouse conditions failed, and therefore no mitotic counts were possible.

## RESULTS

### POACEAE:

*Muhlenbergia quadridentata* (H.B.K.) Kunth,  $n = 10$ . MEXICO. México: 2 km W of Río Frio, North exposition of Volcán Iztaccihuatl, 3100 m, *Pinus-Quercus* forest, Herrera & Cortés 919 (CIIDIR,MTMG).

*Muhlenbergia virescens* (H.B.K.) Kunth,  $n = 10$ . MEXICO. Chihuahua: 25.6 miles S of Creel on road to Batopilas, 2100 m, table rock with *Arctostaphylos*, *Pinus* and *Quercus* spp., Herrera with Peterson & Annable 969 (CIIDIR,MTMG).

*Muhlenbergia montana* (Nutt.) Hitchc.,  $n = 20$ . MEXICO. México: Entrance to the National Park "Lagunas de Zempoala", 2960 m, forest of *Pinus hartwegii* and *Abies religiosa*, Herrera & Cortés 926 (CIIDIR,MTMG).

All of them showing stable microsporocytes with normal bivalents during meiosis.

Recorded chromosome numbers from Reeder (1967, 1968) are: *Muhlenbergia virescens*  $2n = 24$  and *M. montana*  $2n = 40$ .

## DISCUSSION

The basic chromosome number recognized for *Muhlenbergia* is settled as  $x = 10$  (Pohl 1964; Reeder 1967, 1968; Peterson 1988). Diploidy ( $n = 10$ ) and tetraploidy ( $n = 20$ ) are the most common in this genus, however one case of octaploidy was reported by Pohl (1964) for *M. californica* Abrams, a rare endemic species.

Chromosome counts remain necessary to support the interpretation of evolution in this genus. One of the important findings here is that the more widely distributed species of the complex (*Muhlenbergia montana*) is a tetraploid, while the other two

species from more restricted geographic areas (*M. quadridentata* and *M. virescens*), are diploids. All this seems to support the theory of evolution of grasses (Stebbins 1956).

#### ACKNOWLEDGMENTS

The author acknowledges the Instituto Politécnico Nacional and COFAA-IPN for financial support, and thanks the reviewers.

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## A NEW COMBINATION IN MUHLENBERGIA (POACEAE)

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### ABSTRACT

Systematic analyses of morphological and anatomical variation among populations of *Muhlenbergia villiflora* and *M. villosa* indicate that there is insufficient differentiation to warrant recognition of these taxa as separate species. The new combination of *M. villiflora* var. *villosa* is proposed as a more appropriate means of recognizing the habitat preference and slight differences in spikelet size that distinguish these taxa. Nomenclatural data and a key to the varieties are provided.

KEY WORDS: *Muhlenbergia*, Poaceae, systematics

Species of the *Muhlenbergia repens* Hitchc. complex are distributed throughout North America (excluding the southeastern United States), and in the Andean highlands of South America. This complex consists of eight species characterized by a rhizomatous perennial habit with short culms seldom exceeding 20 cm, short involute leaf blades, and a short contracted panicle with awnless or mucronate spikelets. Two species, *M. villiflora* Hitchc. and *M. villosa* Swallen, differ from the others by having a densely villous lemma and palea. These species appear distinct from each other in that *M. villosa* is slightly larger in all morphological attributes including plant height, leaf size, inflorescence length, and spikelet length. Their distribution and habitat requirements are also distinct; *M. villiflora* is an ecological dominant in gypsum soils of northern México, and *M. villosa* is locally sporadic to common in alkaline or calcareous soils of west Texas and New Mexico.

Morphological and anatomical analyses of these two species (Morden 1985; Morden & Hatch 1987) have shown that specific recognition of both taxa is not warranted. Anatomically, these taxa are indistinguishable (Morden & Hatch 1987), and plants of *Muhlenbergia villiflora* found growing along the margins of their natural habitats (*i.e.*, soils with a more abundant water supply or lower concentration of gypsum) are larger, and approach *M. villosa* in most characteristics. Therefore, these species are herein treated as a single species, *M. villiflora*, and the two forms are recognized as varieties, var. *villiflora* and var. *villosa* (Swallen) Morden based on their

habitat preferences and morphological differences. A key to the varieties and complete descriptions are provided below.

Spikelets usually less than 2.0 mm long; plants of gypsiferous soils of northern México. ....1. *M. villiflora* var. *villiflora*  
Spikelets usually greater than 2.0 mm long; plants of alkaline or calcareous soils, west Texas and New Mexico. ....2. *M. villiflora* var. *villosa*

1. *Muhlenbergia villiflora* Hitchc. var. *villiflora*, North Amer. Fl. 17:470. 1935.-- *Vilfa pubescens* Fourn., *Mex. Pl.* 2:102. 1886. TYPE: MEXICO. Cañon de las Miñas et Victoria, inter Michibuaana et Tanquecillos, *Karwinsky 1012* (HOLOTYPE: P; Type fragment: US!). Not *Muhlenbergia pubescens* (H.B.K.) Hitchc. (North Amer. Fl. 17:460. 1935.).

Perennial with scaly rhizomes; the scales 3-18 mm long, acute, often deteriorating with age. Culms much-branched above, wiry, erect, seldom spreading, 7-17 cm tall (rarely higher), 0.3-0.7 mm diam., glabrous; internodes 5-33 mm long, nodulose-roughened at least below the inflorescence. Sheaths 3-16 mm long, usually about 1/2 the length of the internode, margins hyaline and clasping at the base, open and diverging from culm near the leaf collar. Ligules membranous, 0.3-1.5 mm long, erose, toothed, or acute, decurrent. Blades 3-19 mm long, 0.2-1.0 mm wide, abaxial surface glabrous, adaxial surface pubescent, strongly involute and arcuate spreading, margins scabrous, prominent midvein absent. Inflorescence a contracted panicle, 1-4 cm long (occasionally longer), 1-15 mm wide or wider if branches open or reflexed, usually exerted above the upper leaf sheath; inflorescence branches solitary at each node, with 4-11 nodes per inflorescence; branches ascending. Pedicels 0.1-1.1 mm long, minutely setose. Spikelets 1.4-2.3 mm long, not crowded on the branches, 1-15 spikelets on the lowermost panicle branch. Glumes equal, 0.6-1.7 mm long, acute, 1/2-2/3 the length of the floret, 1 (occasionally 2- or 3-) -nerved, green or purple. Lemmas acute, 1.3-2.3 mm long, 3-nerved, densely villous near the base and along midnerve and margins to near the apex, green or becoming purple at maturity; mucro absent to 0.6 mm long. Paleas 1.0-2.1 mm long, densely villous between the nerves, with color similar to lemma. Anthers 0.7-1.6 mm long, yellow, dark green, or purple. Caryopses narrowly elliptic to linear, 0.7-1.2 mm long, 0.2-0.3 mm wide, dark brown. Chromosome number  $2n=20, 22$  (Reeder 1967).

Distribution. México: Chihuahua, Coahuila, Hidalgo, Nuevo León, San Luis Potosí, and Zacatecas. Open ground in gypsiferous to calcareous soils, often forming extensive stands across gypsum flats.

2. **MUHELENBERGIA VILLIFLORA** Hitchc. var. **VILLOSA** (Swallen) Morden, *stat. nov.*-- BASIONYM: *Muhlenbergia villosa* Swallen, J. Wash. Acad. Sci. 31:350. f. 2 1941. TYPE: UNITED STATES. Texas: 15 miles south of Stanton, 11 July 1928, *Tharp 5048* (HOLOTYPE: US!; Isotypes: GH!, MO!, TEX!).

Perennial with scaly rhizomes; the scales 5-16 mm long, acute, often deteriorating with age. Culms much-branched above, wiry, erect, seldom spreading, 4-30 cm tall, 0.3-0.7 mm diam., glabrous; internodes 5-37 mm long, nodulose-roughened at least below the inflorescence. Sheaths 5-15 mm long, usually about 1/2 the length of the internode, margins hyaline and clasping at the base, open and diverging from culm

near the leaf collar. Ligules membranous, 0.4-1.5 mm long, erose, toothed, or acute, decurrent. Blades 7-30 mm long, 0.2-1.2 mm broad, abaxial surface glabrous, adaxial surface pubescent, strongly involute and arcuate spreading, margins scabrous, prominent midvein absent. Inflorescence a contracted panicle, 1-5 cm long, 1-5 mm wide, usually exserted above the upper leaf sheaths; inflorescence branches solitary at each node, with 5-11 nodes per inflorescence; branches ascending. Pedicels 0.1-1.2 mm long, minutely setose. Spikelets 1.8-2.5 mm long, not crowded on the branches, with 2-9 spikelets on the lowermost panicle branch. Glumes equal, 0.6-1.8 mm long, acute, 1/2-2/3 the length of the floret, 1 (rarely 2) -nerved, green or purple. Lemmas acute, 1.8-2.4 mm long, 3-nerved, densely villous near the base and along the midnerve and margins to near the apex, green or becoming purple with maturity; mucro absent to 0.4 mm long. Paleas 1.7-2.3 mm long, densely villous between the nerves, color similar to the lemma. Anthers 0.9-1.4 mm long, yellow, dark green or purple. Caryopses narrowly elliptic to linear, 1.0-1.4 mm long, 0.2-0.4 mm wide, dark brown. Chromosome number  $2n = 20, 40$  (Morden 1985; Reeder 1967).

Distribution. United States: southern New Mexico and Texas in the Trans-Pecos, western Edwards Plateau and southern High Plains. Open ground in alkaline to calcareous soils, usually in isolated clumps and seldom forming dense stands.

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**SEDUM BOOLEANUM (CRASSULACEAE), A NEW RED-FLOWERED SPECIES FROM NUEVO LEÓN, MEXICO**

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ABSTRACT

A new species of *Sedum*, *S. booleanum* B.L. Turner, is described from Nuevo León, México where it occurs in gypsum outcrops. The taxon is red-flowered and has the habit of *Villadia* but the petals are separate to the base, or nearly so, suggesting a position in *Sedum* where it apparently has no close relatives. A photograph of living material is also presented, along with a photograph of its namesake.

KEY WORDS: Crassulaceae, *Sedum*, systematics, México, Nuevo León

Routine identification of Mexican plants has revealed the following novelty, which was called to my attention by the collectors concerned.

**SEDUM BOOLEANUM** B.L. Turner, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Rayones, Cerro Blanco, 1340 m, gypsum hillsides, forming colonies, 27 Feb 1990, *Hinton et al.* 20468 (HOLOTYPE: TEX!).

Succulenta erecta, perennis, radicibus fibris, 5-8 cm alta. Caulēs 3-4 cm diametro prope basim (ubi siccati) et papilloși. Folia (siccata) ovata, papillosa, 7-10 mm longa, 2-4 mm lata, gradim diminuta ab imo caulis (ubi mox decidua) ad apicem per 1/2-2/3 suas longitudines superposita ut caulem celent. Flores 5-10, terminaliter dispositae in ramis brevibus circinatisque, inflorescentiam congestam, 1-2 cm latam, circa 1 cm altam facientes. Sepala 5, ovata, glabra, circa 3 mm longa, 1.5 mm lata, latissima prope medium, libra vel paene libra ad basim, costis dorsalibus prominentibus. Stamina 5, alternata, petalis circa 3 mm longis, antheris luteis in plantis maturis. Carpella 5, 2-5 mm alta per anthesin, stylis erectis, circa 1 mm longis. Fructus maturi non visi.



Figure 1. *Sedum booleanum*, photograph of type material.





Figure 2. George Boole Hinton, in the field on Rancho Aguililla, Nuevo León, México, at the type locality of *Paronychia hintoniorum* (cf. p. 38 this issue).



Erect fibrous-rooted perennial (?) succulent 5-8 cm high. Stems near base 3-4 mm across (when dried), papillose. Leaves (dried) ovate, papillose, 7-10 mm long, 3-4 mm wide, gradually reduced from the bottom of the stem (where soon deciduous) upwards, overlapping for 1/2-2/3 their lengths so as to obscure the stem. Flowers 5-10, arranged terminal on short circinnate branches, forming a congested inflorescence 1-2 cm wide, ca. 1 cm high. Sepals 5, ovate, glabrous, ca. 3 mm long, 1.5 mm wide, widest at or near the middle, free to the base, or nearly so, with a pronounced dorsal midrib. Stamens 5, alternate with the petals, ca. 3 mm long, the anthers yellow at maturity. Carpels 5, in flower ca. 2.5 mm long, the styles erect, ca. 1 mm long. Mature fruit not available.

According to the collectors, the type was collected at the date given above, subsequently flowering at their residence on 27 June 1990 from which herbarium material was made, this constituting the holotype. The photograph (Figure 1) was also made from type material.

Vegetatively, *Sedum booleanum* much resembles species of the genus *Villadia*, but the flowers appear to be like those of *Sedum*, the petals free to the base, or nearly so.

It is a pleasure to name this very attractive red flowered *Sedum* for George Boole Hinton, age 5 (Figure 2), the great grandson of the well-known Mexican collector, George B. Hinton (1880-1943). In spite of his relative youth, George Boole has become a fourth generation plant collector in México. He reportedly often accompanies both his father, George, and his grandfather, James, on various collection expeditions to the Sierra Madre Oriental of northeastern México. Let's hope he continues this familial tradition.

#### ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Mark Mayfield for reviewing the manuscript.

## A NEW SPECIES OF *STEVIA* FROM MEXICO

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### ABSTRACT

A new species of *Stevia*, *S. stolonifera* is described from México.

KEY WORDS: *Stevia*, Asteraceae, México, systematics

The genus *Stevia* consisting of ca. 250 species has two centers of diversification; one in México and another in the Andes Mountains (King & Robinson 1987). Mexican representatives have been comprehensively studied by Grashoff (1972, 1974) who recognized 79 species in his unpublished monograph (dissertation in 1972) and described three additional species in 1974. Since then, five additional species have been described from México (McVaugh 1982; Turner 1992, 1993a, 1993b).

From the view point of reproductive biology, herbaceous species of Mexican *Stevia* are particularly interesting because agamospermy is prevalent among them and specimens with irregular pollen grains (putative apomicts) are known from 32 of the 54 species (Grashoff 1972). To elucidate the evolutionary processes of agamospermy, we are carrying out studies on sexual populations of the herbaceous species. In the course of this study, we have recognized the following novelty.

***STEVIA STOLONIFERA*** Yahara & Soejima, *spec. nov.* TYPE: MEXICO. Jalisco: Sierra del Halo, near a lumber road leaving the Colima highway 7 miles SW of Tecalitlán and extending southeasterly toward San Isidro: Steep slopes in mesophytic forests near summits of barrancas in pine zone 13-16 miles from highway; 2000-2200 m; 28-30 Nov. 1959, R. McVaugh & W.N. Koeltz 1169 (HOLOTYPE: TEX).

*Steviae origanoidae* H.B.K. similis sed rhizomus stoloniferis et foliis crassis subintegris reticulatis differt.

Stoloniferous perennial herbs to 1 m tall. Stems 1-several, simple below, erect, often purplish, puberulous. Internodes as long as leaf blades. Leaves opposite, thick,

semisessile, oblong, 3-5 cm long, 1-2 cm wide, entire or inconspicuously crenate; apex obtuse; base cuneate; upper surface glabrous or sparsely puberulous, glandular-punctate; lower surface paler, reticulate, sparsely puberulous along veins, glandular-punctate. Inflorescence a compound corymb, the total inflorescence up to 4 cm across; branches opposite, puberulous; bracts up to 2.5 cm long, foliaceous, conspicuous. Heads 7-8 mm high, nearly sessile, in small groups ca. 1.0-1.5 cm across. Involucres cylindrical, 4.5-5.5 mm high, sparsely puberulous, sessile-glandular. Phyllaries oblong, acute at apex. Florets white, glabrous, sparsely glandular; lobes ca. 1 mm long, throat plus tube ca. 4 mm long. Achenes heteromorphic, aristate, ca. 2 mm long, dark brown, glabrous except along ribs. Pappus of the 4 adelphocarps of 3 awns, ca. 4 mm long alternating with scales less than 0.2 mm long, fimbriate.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Michoacán: Volcán Parícutín, Mpio. Uruapan, 16 Nov 1983, *F.R. Barrie* 553 (TEX); Coalcomán, 20.9 km al Oeste de Coalcomán hacia Coahuayana, terracería, 550 m, 17 Dec 1984, *C.P. Cowan* 4908 (TEX).

This species may be related to *Stevia origanoides* H.B.K. but distinctively differs in stoloniferous rhizomes and thick, nearly entire leaves reticulate beneath. The specimens of *S. stolonifera* were collected from western Michoacán and southeastern Jalisco where typical *S. origanoides* occurs. Among the three specimens cited above, *Cowan* 4908 has normal pollen and is regarded as sexual while pollen is irregular in *McVaugh* & *W. N. Koelz* 1169 (holotype) and *Barrie* 553 that are therefore considered to be asexual.

#### ACKNOWLEDGMENTS

We are grateful to Billie Turner for reviewing the manuscript.

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**PARONYCHIA HINTONIORUM (CARYOPHYLLACEAE), A NEW SPECIES  
FROM NUEVO LEON AND VERACRUZ, MEXICO**

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ABSTRACT

*Paronychia hintoniorum* B.L. Turner *spec. nov.*, is described and illustrated. It occurs in the states of Nuevo León and Veracruz, México, and is closely related to the widespread *P. mexicana*, and is well differentiated by both vegetative and floral characters. Distribution maps of the two species are provided.

KEY WORDS: Caryophyllaceae, *Paronychia*, systematics, México, Nuevo León, Veracruz

Routine identification of plants from northeastern México has revealed the following novelty.

**PARONYCHIA HINTONIORUM** B.L. Turner *spec. nov.* Figure 1. TYPE: MEXICO. Nuevo León: Mpio. Galeana, Rancho Aguillilla, ca. 1900 m, 22 Jul 1995, *Hinton et al.* 25368 (HOLOTYPE: TEX!).

*Paronychia hintoniorum* B.L. Turner, *spec. nov.*; similis *P. mexicana* Hemsl. sed foliis oblanceolatis glabriusque, apicibus non spinulosis, et calycibus majoribus glabriusque.

Perennial sprawling or recumbent herbs from lignescent tap roots to 25 cm high, the stems simple, numerous and procumbent from the base of the plant, very sparsely puberulent to glabrous; stipules white-scarious, 3-4 mm long and as wide, acute to rounded apically. Leaves opposite throughout, gradually reduced upwards, those at midstem oblanceolate, 10-25 mm long, 3-7 mm wide, glabrous throughout, the apices obtuse to acute, not clearly apiculate or setose. Flowers axillary, few to numerous in fasciculate or subfasciculate offshoots or clusters. Calyces glabrous, 3.5-4.0 mm long; sepals united below for 1.5-2.0 mm, the lobes 1.5-2.0 mm long, white-marginate, 1-3 nervate, acute apically. Stamens 5, small, ca 1.5 mm long, united below into a scarious sheath. Ovary ca. 1.5 mm high, sparsely short-glandular apically, style ca. 0.3 mm long. Fruits and seeds not available.

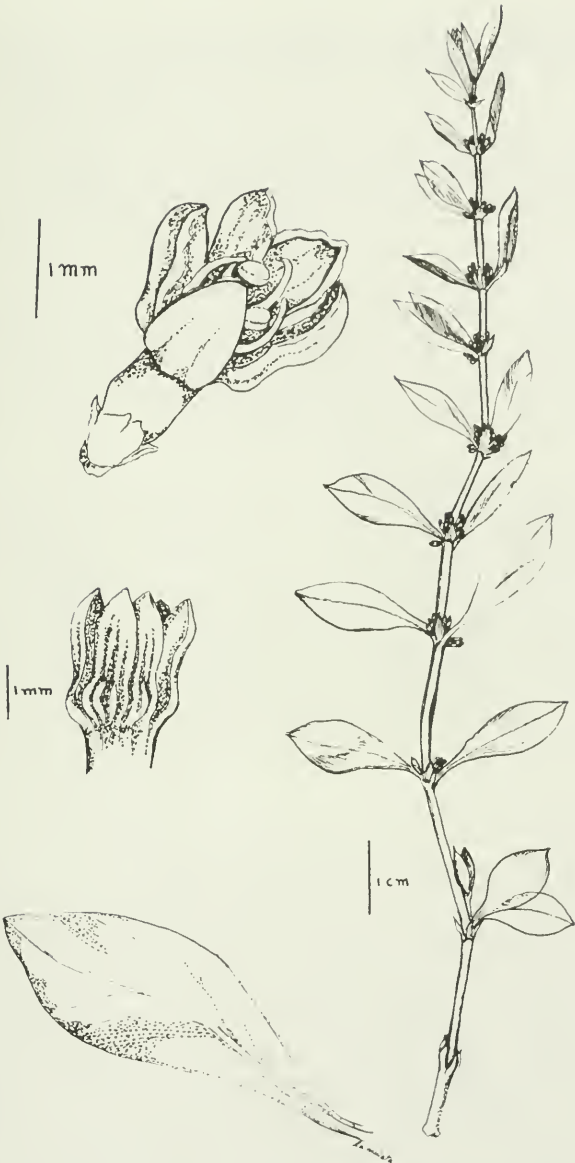


Figure 1. *Paronychia hintoniorum*, a single stem and flower from the holotype.





Figure 2. Distribution of *Paronychia mexicana* (open circles), and *P. hintoniiorum* (closed circles).

ADDITIONAL COLLECTION EXAMINED: MEXICO. Veracruz: Mpio. de Perote, Totalco, "Orilla de camino", 2300 m, 7 Jul 1970, F. Ventura A. 1537 (LL,US).

*Paronychia hintoniorum* is clearly related to *P. mexicana* Hemsl. but is markedly different in leaf shape and vestiture (oblanceolate, glabrous, and acute to obtuse apically, vs. linear-lanceolate, markedly hirsute and apices spinulose, respectively), and larger glabrous calyces (3.5-4.0 mm long vs. 1.4-2.0 mm) having ribbed lobes (vs. nearly ribless and pubescent).

Both of the above cited collections occur along the periphery of the known range of *Paronychia mexicana* and because of their marked differences are unlikely to be but forms of the latter. I wrote to the Hinton family, upon whose rancho the type collection was made (cf. p. 31, this issue), asking them to examine populations at the type locality, especially to ascertain if it might not be weedy at this site. George Hinton, the grandson of the legendary México collector, George B. Hinton, responded:

I went back to the locality of the *Paronychia* and observed the following: it grows at the base of a limestone hill in colonies of *Agave lechuguilla*. In these colonies it grows with *Acacia* sp., *Acalypha monostachya*, *Bahia absinthifolia*, *Berberis trifoliolata*, *Dyschoriste schiedeana*, *Ephedra aspera*, *Flourensia cernua*, *Gymnosperma glutinosum*, *Loeselia caerulea*, *Mortonia palmeri*, *Opuntia phaeacantha*, *Yucca filifera*. Less frequently it grows as above with *A. striata* instead of *A. lechuguilla*. Its habit is procumbent although it frequently climbs up on the plants around it. The stems are about 0.25 m; the ones I sent you are much smaller because of the difficulty of getting your hand down to the base of the plant thru the *Agave*. I collected about 12 sheets, with several complete plants which I will send you when dry. It only grows in the agave patches, and these are strung for about 120 m. along the base of the hill. It doesn't appear to be a weed.

He also sent additional sterile material which matched that of previous collections.

I am aware of the wide geographical gap between the only two sites known for this species (Figure 2). The Veracruz specimens are, except for their somewhat smaller leaves and more floriferous condition, almost exactly like that of type material. Label data on Ventura's specimen report the plant as "crece en lugares despejados; abundantes". Veracruz populations of *Paronychia hintoniorum* are located near populational sites of *P. mexicana*, the latter readily recognized by the characters alluded to in the above account. It is perhaps tempting to believe that *P. hintoniorum* might be but a populational growth form of *P. mexicana*; if so, then these must rank as among the most remarkable populational segregates within a single species to my knowledge. In any case, comparable material was not detected elsewhere among the broad range of *P. mexicana* examined in this study. Indeed, Chaudhri (1968) recognized two subspecies under *P. mexicana*, one of these with two varieties. I examined type material of these taxa and all are essentially alike (except for variation in stamen number, a variable organ set as noted by Core [1943]). Apparently, Chaudhri did not examine material of what is here called *P. hintoniorum* or else he would have

surely dubbed this with a name, to judge from his annotations on a broad range of specimens at F, GH, LL, TEX, US.

It is a pleasure to name this taxon for the Hinton family, upon whose property the type locality occurs.

#### ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to Piero Delprete and Mark Mayfield for reviewing the paper. The drawing was executed by Marcia Thompson. Distributional maps (Figure 2) are based upon specimens at F, GH, LL, TEX, US.

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A NEW SPECIES OF *PITTOCAULON* (ASTERACEAE, SENECEONEAE)  
FROM OAXACA, MEXICO

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ABSTRACT

*Pittocaulon calzadanum* B.L. Turner, *spec. nov.* is described and illustrated. It is a tree 3-5 m high with fore-shortened stems, rayless white heads and pinnate leaves and is known from only a restricted area of Oaxaca, México (Mpio. Santos Reyes Tepejillo). The species does not appear to be especially closely related to yet other taxa of *Pittocaulon*, and future workers might treat the species as belonging to a monotypic genus.

KEY WORDS: Asteraceae, Senecioneae, *Pittocaulon*, systematics, México, Oaxaca

Routine identification of Mexican Asteraceae has revealed the following novelty.

***PITTOCAULON CALZADANUM*** B. L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Oaxaca: Distr. Santiago, Juxtlahuaca, Mpio. Santos Reyes Tepejillo, 3 km N of Santos Reyes Tepejillo "a Corral de Piedra" (17° 27' N × 97° 57' W), ca. 1770 m, 21 Apr 1995, J.L. Calzada 19872 (HOLOTYPE: TEX; Isotypes: to be distributed).

*Arbor* 3--5 m alta. *Caules* terminales non angustati, cicatricibus foliorum delapsorum notati; cortex semisucculenta, textura interior lignea, cellulis resiniferis inspersa. *Folia* alterna; petioli 3--5 cm longi; laminae latae, ovato-ellipticae, pinnatinerviae, 10--20 cm longae, 3--7 cm latae, tomentosae; margine irregulariter lobatae. *Capitulescentia* paniculato-corymbosa 50--100-cephala, aut triangulata aut ovata, pedunculis ultimis tomentosis, saepius 3--8 mm longis. *Involucra* cylindro-campanulata; bractae interiores 8, lanceolatae, 6--7 mm longae, 1--2 mm latae, tomentosae aetate glabrae, marginibus chartaceis candidis. *Receptaculum* circa 2.5 mm longum, alveolatum, paleis nullis. *Flosculi* radiantes nulli. *Flosculi disci* cujusque capituli 8; corollae candidae, glabrae, 7--9 mm longae, lobis irregularibus 2--3 mm longis, ut videtur lactiferis. *Achenia* (immatura) columnaria, circa 2.5 mm longa, glabra;

carpopodia bene evoluta, annulata; pappi setae capillares, numerosae candidae, 6--7 mm longae, marginibus (praecipue inferne) scabridiusculae.

Tree 3-5 m high. Stems (terminal), abruptly fore-shortened, the bark semisucculent, and the interior with hard woody tissue, the latter suffused with resinous cells. Mature leaves alternate, densely velvety-tomentose, deciduous at anthesis, leaving a pronounced scar; petioles 3-5 cm long; blades broadly ovate to deltoid, pinnately nervate, 10-20 cm long, 3-7 cm wide, moderately tomentose on both surfaces, the margins irregularly lobate. Capitulescence a terminal, ovoid or trianguloid, corymbose panicle of numerous (50-100) heads, the ultimate peduncles tomentose, mostly 3-8 mm long. Involucre cylindrocampaulate, the inner bracts 8, lanceolate, 6-7 mm long, 1-2 mm wide, tomentose, glabrate with age, the margins white-chartaceous. Receptacle ca. 2 mm across, epaleate, alveolate. Ray florets absent. Disk florets 8-10 per head; corollas reportedly white, glabrous, 7-9 mm long; tubes 4-5 mm long; the throat 2-4 mm long, irregularly lobed, the lobes 2-3 mm long, apparently lactiferous. Achenes (immature) columnar, ca. 2.5 mm long, glabrous; carpodia well-developed, annulate; pappus of numerous white capillary bristles 6-7 mm long, the margins minutely scabridulate, especially below.

Label data describe the tree as 3 m high having white corollas and yellow stamens. It also states that the plant occurs in tropical deciduous forests and is "mass bien escasa". Calzada, who collected the type, revisited the site and tree concerned in July of 1995 (*Calzada s.n.* [TEX]) so as to collect mature leaves (not shown in Figure 1); leaf measurements in the present description were obtained from this collection. José Panero, who also visited the site concerned, states (pers. comm.):

The new *Pittocaulon* is a very remarkable plant. It is a small tree of the tropical deciduous forest. It can grow to 5 m tall. The leaves are kind of gray-green, somewhat silvery. The plant is an inhabitant of rocky, limestone outcrops. I first saw the plant in March of this year and asked Ismael [Calzada] to collect it. At first, I thought it was going to be a weird *Parthenium*, later I was surprised to see it was a *Senecio*.

It grows with *Frexinius purpusii*, *Conzattia multiflora*, *Xylosma flexuosum*, *Schoepfia angulata*, *Erythrina petrea*, *Croton* sp., *Jatropha* sp., *Bunchosia trifoliata*, *Quercus glaucoides*, among others.

As noted by Panero, this is a remarkable *Pittocaulon*, the latter a generic segregate from *Senecio* first proposed by Robinson & Brettell (1973), who recognized five species in the genus, all confined to south-central México. Jeffrey (1992) also recognized the genus as distinct, emphasizing its subumbellate inflorescences, cortical resin ducts and palmately veined leaves. Barkley (1985), however, retained *Pittocaulon* in *Senecio* (s.l.) although he now accepts its generic status (pers. comm.). *Pittocaulon calzadamun* has a corymbose-paniculate capitulescence, pinnately veined leaves, eradiate heads, and relatively deeply lobed, white corollas. In short, a very different looking *Pittocaulon* than those described to date. When I first examined the plant I took it to be, because of its narrow white discoid heads, a species of *Digiticalia*, but the woody habit, abruptly foreshortened stems, semisucculent bark and attainment of anthesis before the leaves appear, strongly suggest that it belongs to the *Pittocaulon*



Figure 1. *Pittocaulon calzadanum*, from holotype.



2. Calyx lobes with spreading hairs 0.4-0.6 mm long; midstem leaves mostly 1-2 cm long; San Luis Potosí, Guanajuato, Querétaro, and Hidalgo. . . var. *palmeri*
2. Calyx lobes glabrate or with hairs appressed, if somewhat spreading then the hairs 0.2 mm long or less; midstem leaves mostly 2-4 cm long; Nuevo León and closely adjacent Coahuila and Tamaulipas. . . (3)
3. Calyces mostly 4.5-5.5 mm long, the lobes greenish with short spreading hairs 0.1-0.2 mm long; central Nuevo León and closely adjacent Coahuila. . . var. *santiagoanum*
3. Calyces mostly 5.5-6.5 mm long, the lobes reddish to purplish, glabrate or nearly so (any hairs minute and appressed); southern Nuevo León (Mpio. Zaragoza) and closely adjacent Tamaulipas. . . var. *zaragozanum*

**HEDEOMA PALMERI** Hemsl. var. **SANTIAGOANUM** B.L. Turner, var. nov.  
 TYPE: MEXICO. Nuevo León: Mpio. Villa de Santiago, between Las Ajuntas and Potrero Redondo, abundant in pine forest, 15 Aug 1939, C.H. Muller 2702 (HOLOTYPE: TEX!).

*H. palmeri* Hemsl. var. *santiagoanum* B.L. Turner, var. nov., similis *H. p. var. palmeri* sed habens folia majora et calyces parviores, hirsutos, 0.1-0.2 mm longos.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Coahuila: Mpio. Arteaga, road from Los Lirios to El Cercado, 2095 m, 29 Jul 1995, Hinton et al. 25446 (TEX). Nuevo León: Mpio. Villa de Santiago, Pasaje de los Osos al Pte. del Yebanis, Santiago, 19 May 1966, Marroquin 1311 (TEX); ca. 18 km al S de Monterrey, 16 Sep 1966, Marroquin 1383 (TEX); Cañon la Boca (100° 19' W × 25° 24' N), 1600 m, 10 Sep 1983, Villarreal 2341 (TEX); 5 km SE of La Trinidad, in Canyon Cebolla, 2000 m, 8 Aug 1988, Patterson 6321 (TEX); Mpio. Montemorelos, trail up Sierra Cebolla from La Trinidad, 1600 m, 6 Sep 1992, Patterson 7163 (TEX).

This variety is distinguished from var. *palmeri* by its relatively small calyces, the lobes of which have a short spreading, pubescence, and its relatively large leaves. Occasional specimens appear to weakly approach var. *galeanum* (c.g., Patterson 7163!), but overall the vestiture of such plants is more like that of var. *palmeri*.

**HEDEOMA PALMERI** Hemsl. var. **ZARAGOZANUM** B.L. Turner, var. nov.  
 TYPE: MEXICO. Nuevo León: ca. 30 mi NE of Dr. Arroyo along Hwy 29 along the first pass; "open pastureland and heavily forested N-facing slopes . . . infrequent perennial, in clearings", 24° 02' N, 99° 58' W, ca. 6000 ft, 9 Sep 1971, James Henrickson 6628 (HOLOTYPE: LL!; Isotype: MEXU).

*H. palmeri* Hemsl. var. *zaragozanum* B.L. Turner, var. nov., similis *H. p. var. palmeri* sed habens folia majora et lobos calycum paene glabros, rubellos.



Figure 1. Distribution of varieties of *Hedeoma palmeri* in northeastern México: var. *galeanum* (closed circles), var. *palmeri* (closed triangles), var. *santiagoanum* (open circles), var. *zaragozanum* (open triangles). Localities vouchered by material at TEX.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Zaragoza, Cerro El Viejo, 2400 m, 7 Jul 1992, *Hinton et al.* 22103 (TEX); Cerro El Viejo, 2200 m, 29 Jul 1992, *Hinton et al.* 22245 (TEX); Cerro El Viejo, 2405 m, 12 Oct 1992, *Hinton et al.* 22486 (TEX); Los Potreritos, 1390 m, 2 Aug 1994, *Hinton et al.* 24541 (TEX). Tamaulipas: Mpio. Hidalgo, Los Caballos, 1750 m, 21 Sep 1994, *Hinton et al.* 24824 (TEX).

The var. *zaragozanum* is a distinctive populational element of the *Hedeoma palmeri* complex and, so far as known, is largely confined to the environs of Cerro El Viejo, mostly between 1400 to 2400 meters where it occurs in pine-oak woodlands. It is readily distinguished from var. *palmeri* by its nearly glabrate, reddish-hued calyx lobes, which characters also serve to distinguish it from var. *santiagoanum*. Future workers might wish to treat the taxon as a monotypic element of its own subspecies.

#### ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnoses, and to Mark Mayfield and Piero Delprete for reviewing the paper.

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**A NEW SPECIES OF CERATOSAMIA (ZAMIACEAE) FROM OAXACA,  
MEXICO WITH COMMENTS ON DISTRIBUTION, HABITAT, AND  
RELATIONSHIPS**

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**ABSTRACT**

*Ceratosamia whitelockiana* spec. nov., from Oaxaca, México is described and illustrated. The species differs from others in the genus in the upright habit of its few, large, glaucous, pea-green leaves with comparatively long petioles and relatively small megastrobili and microstrobili. It is most closely related to *Ceratosamia miqueliana* Wendland (Vovides *et al.* 1983; Stevenson *et al.* 1986); having similar cones, caudex, and leaf color but differs in the habit, size, and shape of the leaves. *Ceratosamia whitelockiana* is known only from the drainage of the Río Valle Nacional, at elevations from 335 to 975 m.

**KEY WORDS:** *Ceratosamia*, México, Oaxaca, Zamiaceae, systematics

**CERATOSAMIA WHITELOCKIANA** Chemnick & Gregory, spec. nov. TYPE: MEXICO. Oaxaca: Vicinity of Metates, south of Valle Nacional, May 1995, Chemnick & Gregory 5 (HOLOTYPE: HNT; Isotypes: to be distributed to FTG & XALU. Cultivated specimens at GannaWalska Lotusland, Santa Barbara, California; Mildred Mathias Botanic Garden, UCLA, California; and UCSB Greenhouse, Santa Barbara, California.

Truncus semihypogaeus, ad 30 cm altus; cataphylla lanata, triangularia, 5 cm longa basi 5 cm lata; folia pauca, usque 5, glauca; petiolus teresve, 2.0-2.5 m longus, parte infima dilatatus, pauca spinis armatus; rachis subteres, supra bisulcata, in dimidio inferiore, paucis spinis armata, supra fere inermis vel inermis, in cuspidem 10-25 mm longam excurrent; foliola opposita vel subopposita, 30-40 juga, lanceolata vel falcata, 30-50 cm longa, 30-38 mm lata, papyracea, pisacea, tenuia, basi attenuata, apicem attenuata, margine integerrima, revoluta; 22-27 nervis moderata; strobilus microsporangiatu linearis-cylindricus, 26-28 cm longus, 15-28 mm latus; pedunculus tomentosus, 20-30 mm longus, 11-15 mm latus; strobilus megasporangiatu cylindricus, apice mucronatus, 14-18 cm longus, 7.5-10.0 cm latus; pedunculus 1-2 cm longus.

## MORPHOLOGY

Stem solitary, semihypogeous, moderately short (20-30 cm), cylindric (12-18 cm in diameter), covered by rough, irregular persistent leaf and cataphyll bases, brownish-red; cataphylls wrinkled, stipulate, triangular, densely white hairy at crown, irregularly arranged on lower portions of stem, 5 cm wide and 5 cm long; leaves 2.0-2.5 m long, usually in whorls of 2-4, recently-emerged and juvenile leaves glaucous on both surfaces, light pea-green, older leaves glabrous, uniformly medium-green on both surfaces, adult plants with up to 2 previous whorls of leaves; petiole 1.00-1.25 m long, terete with an expanded base, 15 mm in diameter at base and tapering gradually to 8 mm at the first leaflet, sparsely armed with simple spines (1-3 mm), spines more densely distributed proximally and becoming sparse distally; rachis nearly straight, subterete, very sparsely armed on proximal 25%, ending in conical-linear apex 10-25 mm long and unarmed; adaxial surface is flattened and shallowly bisulcate with leaflets inserted in the paired grooves up to 5 mm apart, the paired grooves arising distally to the first pair of leaflets; leaflets linear lanceolate to falcate, papyraceous, the median leaflets 30-50 cm in length, gradually attenuate, 30-38 mm in width with 22-27 veins slightly raised on abaxial surface, 30-40 "pairs" inserted on 25-50 mm centers, opposite to sub-opposite, 9-12 mm wide at point of attachment on rachis, margins are slightly revolute and turned upward, basal 25-30% of leaf keeled becoming flattened distally, leaflets gradually reduced in length towards apex; microsporangiate strobilus elongate-conical, solitary, 26-28 cm in length, 28 mm in diameter at base, 15 mm in diameter distally, mucronate, peduncle 20-30 mm in length and 11-15 mm in diameter, tomentose to wooly; microsporophylls 8 mm wide and 3 mm long, sporangia in a single patch, olive green; megasporangiate strobilus cylindrical to ovoid with a large apiculum, solitary, overall length 14-18 cm and diameter 7.5-10.0 cm at maturity, apiculate cap 1.5-3.0 cm in length and 3-5 cm in width, megastrobilus borne on a short peduncle 30-38 mm long and 18-20 mm wide; megasporophyll length 2.5-3.0 cm, sporophyll face 3.5-5.0 cm wide and 17-23 mm long, inner face somewhat glabrous except for the moderately rolled margins which are gray tomentose; sporophyll horns divergent to either side of the sporophyll up to 10 mm long, only slightly raised from the sporophyll face, outer edges grey and tomentose, horns joined by a wrinkled raised edge; megastrobilus with short purple hairs sparsely scattered on sporophyll face and sarcotesta where exposed between megasporophylls which are widely separated at maturity by the fully-developed seeds; sarcotesta white, soon turning brown as it ripens; 31-33 mm long, 25-27 mm wide; sclerotesta irregular, ovoid, tan, 24-26 mm long, 18-20 mm wide, smooth with 8-9 indistinct longitudinal ridges.

**Etymology:** The species is named to honor Mr. Loran Whitelock of Los Angeles, CALIFORNIA for his remarkable dedication and contribution to cycad biology and awareness throughout the world.

## DISTRIBUTION AND HABITAT

*Ceratozamia whitelockiana* is known only from the drainage of the Río Valle Nacional in montane tropical forest within the range of 335-973 m, but occurs more commonly at lower elevations (335-600 m). Habitat consists of very steep slopes

with small pockets of remnant primary forest now covered mostly by coffee and banana groves and secondary growth. The patchy canopy consists of emergent trees to 40 m covered with epiphytes. *Ceratozamia whitelockiana* occurs on heavily shaded east- and west-facing slopes in primary forest with *Chamaedorea* sp., *Geonoma* sp., *Melastoma* spp., *Acanthus* sp., *Ficus* sp., *Begonia* sp., *Selaginella* sp. Soil is light-colored crumbly, rocky clay with outcroppings of sedimentary rock. *Ceratozamia whitelockiana* growing in exposed, deforested areas have extremely bleached, yellow leaves. The entire locality is rapidly being cleared and burned and thus this cycad must be considered endangered. In our most recent survey of the locality in May, 1995 we found approximately 250 plants during 3 days of field work. The same areas were visited several times in 1979, 1980, and 1981 and the population of *Ceratozamia whitelockiana* was considerably larger then, perhaps by twice as many individuals. Since this cycad is seldom seen in collections, it appears that habitat destruction is the greatest threat to its existence. The more inaccessible reaches of the Rio Valle Nacional drainage are likely to contain many pocket populations of *Ceratozamia whitelockiana* but the rapid rate of deforestation will soon reach areas that are currently inaccessible. In May 1995, the smoke from clearing fires was intense and recently cleared fields, as evidenced by still fresh, charred remains, were spread throughout the drainage like a patchwork quilt. This cycad does not seem to persist in open situations or in second growth forest for very long. The only plants we found in cleared areas were artificially maintained by local farmers and appeared bleached and chlorotic.

#### RELATIONSHIP TO OTHER SPECIES OF *CERATOZAMIA* AND DISCUSSION

The current state of taxonomy within the genus *Ceratozamia* is confused, ambiguous, and incomplete. Three of the most widespread taxa, both in the wild and in cultivation, *C. mexicana* Brongniart (Vovides *et al.* 1983; Stevenson *et al.* 1986), *C. robusta* Miquel (Vovides *et al.* 1983; Stevenson *et al.* 1986), and *C. latifolia* Miquel (Vovides *et al.* 1983; Stevenson *et al.* 1986) are based on vague and obscure descriptions and neotypifications. Locality information is either non-existent or too generalized. Important morphological data such as male and female cone descriptions are incomplete or omitted. When considered from historical perspective, the neotypifications assign the above specific epithets to localities of *Ceratozamia* which do not necessarily correspond to the most likely localities where the original authors and collectors might have been in the mid 1800's when access into México was much more restricted than today. The many isolated populations, forms, ecotypes, and varieties of the large-leaved *Ceratozamia* have been treated within the above three taxa with apparently little regard for valid character differences that in some cases might suggest separation at the species level.

*Ceratozamia whitelockiana* is distinguished from the other large-leaved *Ceratozamia* as follows: *C. mexicana* has smooth, dark brown, globose stems to 1 m tall and 20 cm in diameter; numerous, glabrous, dark-green, arching leaves which are heavily armed with numerous spines; megastrobili which are on average 35 cm long and 12 cm in diameter borne on a peduncle 10 cm long; microstrobili which are on average 38-43 cm long and 7-8 cm in diameter borne on a peduncle 8-10 cm long and 2.5 cm in diameter. *Ceratozamia whitelockiana* has rough, cylindrical reddish stems that are much smaller than *C. mexicana* and its few, sparsely-armed, upright, glaucous, pea-green leaves with long petioles are strikingly different than the leaves of *C. mexicana* as are the much smaller male and female cones of *C. whitelockiana*.



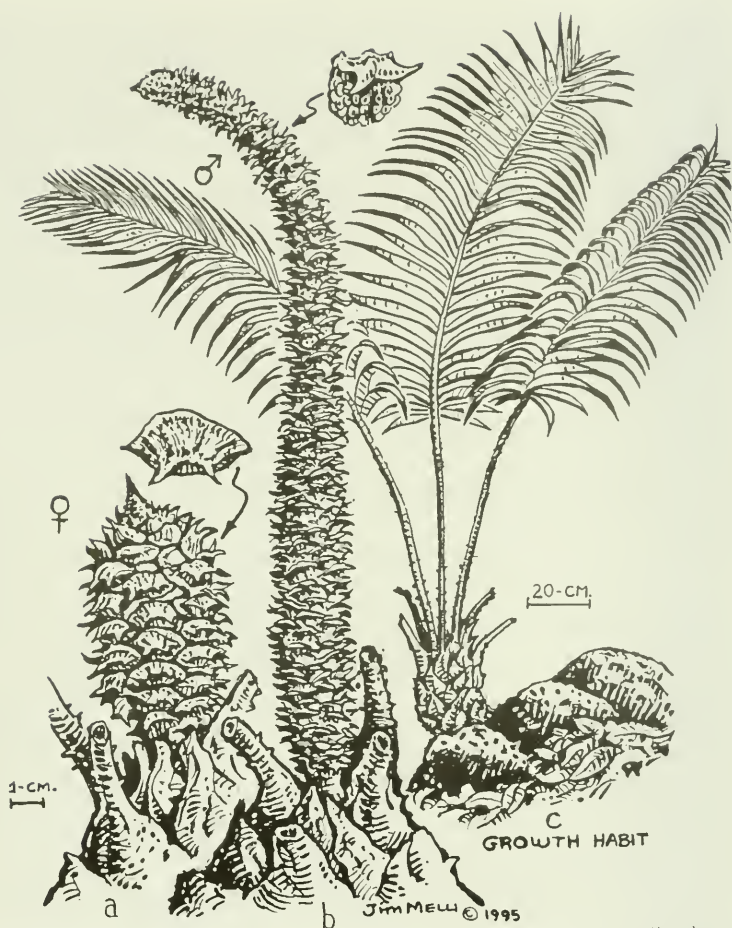


FIG.1-*Ceratozamia whitelockiana*. a, megasporangiate strobilus at pollination. b, microsporangiate strobilus after shedding pollen. c, growth habit.

*Ceratozamia latifolia* stems are globose, light brown, and frequently sucker, especially in cultivation; leaves are 90-150 cm; leaflets are coriaceous, unequally attenuate, slightly overlapping, 20-30 cm long and 33-43 mm wide. *Ceratozamia whitelockiana* stems are solitary, even in cultivation; leaves are 2.0-2.5 m long; leaflets are papyraceous, 30-50 cm long, 30-38 mm wide, and not overlapping.

*Ceratozamia robusta* has very large stems to 1.5 m, numerous, heavily-armed, glabrous dark-green leaves to 2.25 m, megastrobili on average 38 cm long and 15.25 cm in diameter borne on a peduncle 7.5 cm long and 28 mm in diameter, microstrobili 45 cm long and 8 cm in diameter. *Ceratozamia whitelockiana* is a much different plant than *C. robusta* based on many characteristics, but especially in the detail of the male and female cones which, as reproductive structures, are characters of the highest weight.

We stress the differences between these two taxa because in Stevenson *et al.* (1986), figure 7, indicates three populations of *Ceratozamia robusta* in north central Oaxaca. One of these populations appears to occur in the drainage of the Río Valle Nacional. Similarly, in their paper on the distribution of *Ceratozamia*, Moretti *et al.* (1980), figure 1, identifies several populations in northern Oaxaca belonging to the *C. mexicana* complex. The localities are not described in the detailed text that precedes the illustration but the placement of one of those populations would appear to be in the Río Valle Nacional drainage. We have searched extensively for other *Ceratozamia* in the drainage of the Río Valle Nacional, from the municipality of Valle Nacional up to 2,200 meters but have only found *C. whitelockiana*.

It is noteworthy that *Ceratozamia whitelockiana*, *C. robusta*, and *C. mexicana* retain their respective phenotypes even when cultivated for many years under varying conditions. We have grown all three taxa for over fourteen years and found that cultivated individuals are easily distinguished. We make this observation with respect to remarks in Stevenson *et al.* (1986a) regarding the validity of *C. microstrobila* Vovides & Rees. Stevenson *et al.* (1986a) assert that *C. latifolia* and *C. microstrobila*, are the same because "when cultivated in conditions of high moisture and deep shade, plants assignable to *C. microstrobila* 'turn into' plants of *C. latifolia*. Conversely, when plants assignable to *C. latifolia* are exposed to conditions that are dry with high light intensity, they 'turn into' plants of *C. microstrobila*. In our opinion, the plants that have been referred to *C. microstrobila* are nothing more than forms of *C. latifolia* that are phenotypical expressions of environmental conditions. Therefore, we recognize only *C. latifolia* and consider *C. microstrobila* to be a synonym." However, a careful character examination of these two taxa reveals a host of differences that justify separation at the species level. We have similarly cultivated both taxa for seventeen years and have observed cultivated specimens of numerous individuals of both taxa in other gardens and collections, and have never seen the alleged change of phenotypic expression whereby one taxon "turned into" the other, regardless of whether the individuals were grown in full sun, heavy shade, or even in the greenhouse. Therefore we reject the assertion that *C. latifolia* and *C. microstrobila* are synonymous but rather that each is a distinct species. Similarly, we reject any *ad hoc* hypothesis that *C. whitelockiana* is merely an ecotype of *C. robusta* or *C. mexicana*.

*Ceratozamia miqueliana* has 7-10 leaves that are distinctively different from those of *C. whitelockiana*. The leaflets are fewer (about 15 pairs), wider (60-65 mm),

unequally and abruptly attenuate. The petiole is heavily armed with long, curved spines which is in stark contrast to that of *C. whitelockiana*, which is much longer overall and sparsely armed with much shorter spines. However, there are many similarities between *C. whitelockiana* and *C. miqueliana* that suggest an affinity between the two taxa. Both species have subterranean to shortly arborescent stems of similar size, shape, and color; each with rough, wrinkled, irregular leaf bases and brownish-red cataphylls. Both species have juvenile and adult emergent foliage which is a very distinctive glaucous, pea-green color which matures into papyraceous, slightly revolute leaflets. The mature foliage retains the glaucous coating for some time, eventually giving way to a more glabrous, medium green color in old age. Male and female cones of both taxa are of similar size. The megastrobilus in *C. miqueliana* averages 11 cm long and 6.5 cm wide and is borne on a short peduncle 30 mm long. In *C. whitelockiana*, it averages 15 cm long and 8 cm wide and is borne on a short peduncle 30-38 mm long. The microstrobilus is 20 cm long and 4.5 cm wide in *C. miqueliana* and 26 cm long and 2.5 mm wide in *C. whitelockiana*. The closest population of *C. miqueliana* to *C. whitelockiana* is approximately 150 km.

Since cytological and genetic evidence currently does not yield any measurable character differences upon which to base species differentiation within the genus (Walters *et al.* 1991), classic taxonomic consideration of characters and weighting of those characters is our basis for conferring specific status to *Ceratozamia whitelockiana* and assigning it to the "*miqueliana* group" which also includes the various forms of *C. miqueliana* and *C. euryphyllidia* Vazquez Torres, Sabato, & Stevenson. It is our hope that workers will continue to investigate *Ceratozamia* in detail to determine the disposition of the many populations and types currently being lumped into vaguely conceptualized and incompletely described taxa that generate confusion and uncertainty rather than create the order, predictability, and sense that responsible taxonomy is supposed to serve.

#### ACKNOWLEDGMENTS

We are grateful to Sherwin Carlquist and Dieter Wilken for reviewing the manuscript and providing valuable assistance. We are indebted to Jim Melli for providing the illustrations and to Loran Whitlock for providing details of cone dimensions.

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### Rexford F. Daubenmire (1910-1995)

"Dauby" was the usual appellation applied by graduate students to Dr. Daubenmire, Professor at Washington State University, Pullman, Washington, during the years 1950-1953 while I was working under the aegis of the late Prof. Marion Ownbey (1910-1974) in the area of plant systematics.

I first read about Dauby's death in the obit section of the *New York Times* (8 September 1995). This was a short but well-written account of his professional life and contributions to ecology. Unfortunately it conveyed very little about the man himself. Indeed, most scientists are largely remembered by brief obits prepared by their professional colleagues in which their lives are summed up as lines culled from their latest CV. Subsequent biographers have to invent their other attributes, especially for scientists who are reluctant to write personal letters or expose their psyches.

Perhaps, for many workers, that is as it should be. But I feel otherwise. Indeed, the only previous obits to have been penned by me (Turner 1972, 1975) were both highly personal, although both were solicited. In these I wished to portray the inner essence of the person, his weaknesses and strengths, beauties, foibles, whatever. Whether or not I succeeded in these endeavors is not so important as the attempt, for these will surely provide future biographers with at least some material by which to humanize their subjects. To me, at least, an individual's work cannot be understood solely by publications and their contents.

The present obit is obviously unsolicited. It is written simply because I thought Dauby was a fine researcher, a commendable undergraduate teacher, and a remarkable professional. Certainly, any deep appreciation I have of the field of ecology comes from my enrollment in all of the courses he taught in botany at W.S.U. during the time of my attendance at that institution. These included autecology, synecology, field ecology, and plant geography; I also served as his T.A. in undergraduate courses in general botany, sitting in on all of his freshman lectures on that subject.

Dauby was, for the most part, a calm, even-tempered, rather handsome man. He wore a full mustache above a seemingly perpetual Gioconda-like smile (unusual for most competitive males of my acquaintance, at the time or since). Even when exceedingly irritated he retained that sphinxious grin: along with his expressive eyes, and thin lips, he exuded a detached serenity that belied his inner turmoils.

At the time I knew him, during the prime of his professional career, aged 40-43, Dauby was lean and well-proportioned, about 5 feet ten or so and perhaps 150 pounds. He wore an academic costume to all of his formal lectures: well-creased pants, a professorial tweed coat with leather covered elbows, bowtie, and freshly polished shoes. I remember this well, for the late Art Cronquist (1919-1992), his colleague at the time, for whom I was also a T.A., dressed in just the opposite



fashion, usually a slip-over, much-abused sweater, baggy pants and coat, that looked slept in, occasionally an off-angled mussed tie, and large military-type shoes in various stages of repair. In short, Dauby believed in appearances; Art did not. Like their attires, they were antagonists, but most of the antagonism drifted downward from Dauby. I can still recall a brief statement or two made to himself by Dauby upon hearing the approach of Art along the lower floor of the botany building as Dauby ascended the stairs leading to the second floor, myself along his side. Cronquist, with his six foot eight inch Swedish frame, would usually enter the building with a large booming voice singing whatever song entered his mind, operetta or ballad. On this particular day it was "Oh, she jumped in bed and covered up her head and said I couldn't find her. . . ." and carried on through the whole verse (which I myself sang upon occasion, having learned it as a teenager in Texas). Dauby paused for a second, looking at me with grimaced eyes and no smile, saying "That man! God, that man!" Then he trudged on up to the second floor with a perplexed expression.

In Dauby's formal undergraduate lectures he spoke at a slow clip, very precisely, everything biological presented as black or white, with little, if any, gray areas. He drew precise figures on the chalk board and labeled their parts with easily read names. Excellent teacher, answering questions from the floor briefly but adequately.

In upper undergraduate and graduate level courses he was less effective. For example, in autecology, having written the text himself, Dauby did not feel it necessary to lecture on the subject, rather he would meet his classes so as to answer questions about any ambiguities in the text chapters, which we were all expected to have pored over prior to attendance. Most of these classes lasted 10-15 minutes, though sometimes they were prolonged by an overly querulous student. This permitted him to shorten his teaching load and retire to his office (door nearly always closed) so that he might get on with his research or textbook writings.

Dauby took a different tack for his course in synecology (lectures from which he was hoping to develop a text on the subject, and did). He often became rather enlivened by his own spontaneous insights into the field of community ecology, holding forth on succession, its history, comparing community classification to systematic classification, but always with the admonition to accept such comparisons as "analogous to," not "the same as," *etc.* At such times he could be brilliant, but, sadly, he often took himself too seriously. Indeed, I think he did so much of the time, for he seemed to lack a sense of humor, at least where his utterances about ecology were concerned.

To give an example: holding forth on the contribution of F.E. Clements to the field of ecology, especially as regards climax concepts, Dauby suddenly became reiterative, stating that the trouble with American ecology was that everything important in the field of synecology was discovered by Clements, so much so that one might characterize its history as "Before Clements, B.C., B.C., B.C. . . ." he finally added, "before Christ" with a full grin, Cheshire-like, something unusual for him; clearly, he much appreciated his effective presentation and original commentary. The class (about 60, mostly graduate students from several disciplines, for Dauby's classes were very popular) laughed appreciatively, including myself, but I raised my hand almost immediately after his riveting delivery and interjected rather loudly, and with much glee, and some laughter, "I now take it we're entering A.D., after Daubenmire!"



Instead of appreciating my joshing spontaneity, he became suddenly furious. Red faced and with grin-turned scowl, he ordered me out of the classroom "Out," he said, "Get out." The class was bewildered, for they had all chortled loudly at my retort, so was I, for I never meant to be disrespectful, merely entertaining, attempting to add to the pedagogic verbalization he'd seized upon.

I did leave the class as instructed, very embarrassed of course, although pleased that my peers had perceived my spontaneous remarks as somehow appropriate. Afterwards I tried to apologize to Dauby, but he would have none of it, although he did relent and permitted me back in his class the following week.

My interpersonal relationships with Dauby were largely developed because of my interest and background in plant systematics. I believe he sought out my conversation, both during field courses in connection with his formal classes in synecology, where sack lunches were the rule, and following this or that class lecture in which allusions were made to the views of systematists generally. I believe he mostly wanted feedback on his many attempts to make plant community classification "analogous" to organismal classification. "But they are very different," I would assert, "Community ecologists do not have evolutionary theory as a direct underpinning by which to arrange and classify." "Ah," he would respond, "communities evolve, they are made up of plants and animals, all of which coevolve," etc. And he would usually wrap up the conversation pretty quickly with terse sentences that made his points; (Dauby would have made an excellent trial lawyer speaking before an educated jury). Deep down, I think he knew these analogies were basically misleading, dishonest even, for he not only was well aware of Gleason's (a systematist!) individualistic concepts on community structure but, at the time also coexisted with Prof. R.H. Whitaker, his nemesis at Washington State University during my formative years there.

Like most academic professionals, Dauby had considerable concern about his standing in the field of plant ecology, especially as perceived by his peers. I remember well his deep sense of betrayal by the ecological community, if not the man, when the article by Frank Egler, "A commentary on American plant ecology, based on the textbooks of 1947-1949," first appeared in the October, 1951 issue of *Ecology* (32: 673-695). Egler, a very perceptive, erudite, human, to judge from his well-turned article, compared the ecological texts of F.E. Clements, *Dynamics of Vegetation*, 1949; H.J. Oosting, *The Study of Plant Communities*, 1948; and Daubenmire, *Plants and Environment (A Text Book of Plant Ecology)*. Not only did Egler compare these texts (as indicators of the state of American plant ecology and its development over half a century), he also commented rather freely on the psyches of the authors concerned, especially as related to their academic beginnings. In preparing the present "obit", I re-read Egler's article (after a 44 year hiatus!) and it stills reads as I remember it from my first reading in 1951: a very personal evaluation by a highly skilled communicator with a broad grasp of his field. And he was clearly aware of the controversial nature of his commentaries, noting in his "Postlude," near the end of his article:

I have been accused in this manuscript, both of being holier-than-thou, and of being satanic. With either accusation, I plead that to be both forceful and modest at the same time is a difficult task. If I appear to claim that I can see farther and from greater heights than some others, it is only - to use Newton's oft-quoted analogy - that those few cubits of stature have been attained by

climbing on the backs of giants. The giants are there for others to climb, even though the shoulders may bear us ungraciously.

In the fall of 1951 I was enrolled in Daubenmire's course in autecology, for which his text was mandatory, as noted above. I had not given much thought as to how the text might have been written, but after reading Egler's comments, I developed a greater interest in Dauby's style.

Dauby was undoubtedly flattered that Egler possibly ranked him as among the "giants" of American ecology, but Egler was surely correct that the "shoulders [of such workers] may bear us ungraciously." At least that seemed true of Dauby, who brought up Egler's article time and again during the late fall of 1951, complaining that the editors of *Ecology* should ever have published such a commentary. But what most galled him was Egler's paragraph on Dauby's "style of writing," which, in contrast with Clement's style, was said to have

... succeeded to a high degree in developing a terseness, a paucity of words, a fact-crammed grammatical structure that is the goal of many a scientific writer. It is as functional, as devoid of decorative flourishes and artistic ornamentation as the layercake skyscrapers built lately in New York. As was said by the romanticist against the classicist, his writing had become correct and soulless, learned and uninspiring, scientific and godless, virtuous and cold. One can almost imagine that this author, beginning with terse abbreviated lecture notes, kept building through the years in card-catalogue style, inserting abstracts and summaries in their appropriate places as the new literature appeared. For these reasons, the book will long serve as a well-organized reference work for the American literature on the effects of environmental factors on plants.

And that was the way he lectured too, in both undergraduate and graduate courses, except in his autecology course, in which he never lectured, as noted in the above (the text seemingly written from abbreviated sentences on stacks of cards) with practically no sidebar diversions, even when controversy arose from among the students. And, too, that was the way he must have composed his text on Plant Geography (Academic Press, 1978). I attended his first class towards this new textbook venture in the spring of 1953, just before my doctoral defense scheduled for that same semester. My final personal insights into the man's oeuvre and psyche involves that class.

I truly looked forward to Dauby's course. Having had a firm background in both plant geography and geology as a result of my master's work at Southern Methodist University in 1949-50, to say nothing of my courses in geomorphology and genetics at W.S.U., I felt primed and excited. Dauby even questioned my "need" to take his course, especially since I had made top grades in nearly all of my courses, and he was well aware of my conversational ability in systematics generally. "Concentrate on your doctoral thesis" he advised, knowing that I was scheduled to finish that same semester. But I told him my thesis was essentially written and that I would truly enjoy the class, *etc.* As a member of my doctoral committee, he relented.

Everything went fine in the course on Plant Geography. Dauby each day perfectly poised and academic, covering the topic from 5 × 8 cards with information not especially new or novel, throwing in this or that study called to the fore since Cain's

fine text on the subject, *Foundations of Plant Geography*, which first appeared in 1944. Nothing new really, until suddenly one day he digressed. Lecturing upon the origin of American deserts and their likely age, he bedazzled me (but perhaps not the class) with his observation that the deserts had developed very recently in North America, and that their floras were probably derived out of mostly recently extinct if not extant elements of the more temperate *Artemisia* shrublands and grasslands of the western Rocky Mountains, if not from conifer forests. The kingpin in this hypothesis, he reckoned, was the fossil *Opuntia* described by Chaney from the Green River shales of Utah, "the earliest and perhaps only fossil cactus from the New World" he noted. "We have to be objective and acknowledge the evidence," he continued, drawing the words out tersely, and afterwards donning that smug Gioconda smile he was so adept at when playing his verbal trump cards.

I disagreed, of course, noting in class, lawyer-like perhaps, that all of the floristic evidence argued against his views: the Cactaceae is not well developed in temperate North America, anyway, if an *Opuntia* had happened to become fossilized in Eocene time, then it merely proved the cacti had been around for eons, and that the center of diversity of cacti in North America lay to the south in Arizona, New Mexico, Texas, mostly subtropical regions, much as suggested by Chaney in his paper, and what about *Fouquieria*, *Idria* (both belonging to the Fouquieriaceae, a family of only two genera confined to the hot deserts of North America without clear familial relationship elsewhere) and many other genera too numerous to mention, to say nothing of the genus *Larrea* which dominates the deserts of two continents, etc. On like that I held forth, and Dauby fumed, even entered this fray with a dead look of castigation. "I stand on the fossil data" he said, but noting at the same time that the state of Florida has as many cacti nearly as Arizona or New Mexico, and "certainly Florida is not a desert." "But the Florida cacti mostly belong to the genus *Opuntia*," I said, "many of these, if not most, of recent introduction or else the results of Small's taxonomic splitting of this or that variable entity. Anyway," I retorted, "The cacti of Florida, so far as evidence bearing on the age and origin of the family Cactaceae, is meaningless." And I forget, now, how our 15 minute debate went, but it ended with a stony silence on Dauby's part, and "I wish you weren't here" - look and an early closure of the lecture for that day.

After that venture into Dauby's card session, upon the advice of my graduate student peers, I kept strictly quiet, dutifully recording his lectures in my own shorthand in preparation for our final exam, which was soon upon us.

The exam was well-structured, very fair, and straightforward, as were all of the exams in the four courses I took from him. But for me, on this particular exam, there was a problem. Dauby asked the question (assigning it 10 points): Give the age and origin of the family Cactaceae (not worded so as to be answered, according to Daubenmire!). Nevertheless, I placed in the appropriate space provided the answer according to Daubenmire, recounting his views very nicely I thought. But at the bottom of my answer I wrote "This is the answer which you might wish, Dr. Daubenmire, but for the correct answer, see the backside of this sheet." There I defended my point of view (and those of many others) regarding this issue.

When the final exam was graded and the semester grades posted, I was surprised to see that I had received a 90 on my final exam (the entire cactus question graded as incorrect) and a B in the course. I inquired of him why he did not accept my answer to

the cactus question concerned. His response was "Well, Turner, you got the answer, but you didn't believe it, or else why did you give an additional answer on the back side of the sheet; in short, you only get to give one answer, not two, that's why you missed the whole question!"

"OK," I said, "But what about the B in the course. I had A's in my earlier exams, and a low A (90) on the final, why a B? Other students with much lower averages received A's [I'd made comparisons among my peers]." "Well," he responded, "let's put it this way, you got a B for Bad Behavior," his eyes full on me dead as a desert duck, no water anywhere.

"Fine," I responded, laughing, "now that I know the standards I won't complain, considering the criteria I'm sure I got it fairly." That was one of the few B's I received in my university education and one that I am proudest of.

But the cactus question did not end there. Daubenmire attended my final defense (of a systematic thesis, a cytotaxonomic study of the genus *Hymenopappus*). After most of my committee members had finished asking this or that question, Dauby, who had said nothing to this point, suddenly said, "Turner, when and where do you think the Cactaceae arose?" I was taken aback, but rising to the occasion (I hoped then), I said strongly and affirmatively, without a glimmer of a smile, "Well, Dr. Daubenmire, do you want my answer, or yours?"

Dauby looked very distressed at my response, folded his papers, got up from the large table which was surrounded by about ten professors, and left the room. He did not approve my performance, but (so I was told) the upper administration, appraised his evaluation negatively and I passed my defense without undue rancor.

As a postscript to the cactus story recounted above, I can't help but add that the fossil *Opuntia* described by Chaney from the fossil beds was, some 18 years later, found to be to a fossilized rhizome and associated root system of a monocot, possibly a sedge (Becker 1962). Upon reading this "inspiring" revelation I sent copy of the article to Dauby, with a little memo, merely stating, "Remember this?" He never responded. Nor did he include an account of his views on the origin of the Cactaceae in his text on Plant Geography. Indeed, published some 25 years after that first class on the subject, Dauby's outlook re American deserts changed considerably, even introducing in his text some of the very same views which I propounded in his first course on the subject.

I hope the above account is not viewed by the reader as a "get-even" article. It is not intended as such (to my knowledge). Rather, I hope in this telling to capture an aspect of the man not generally known. Like most of us he had a mixture of traits some admirable, some not. But, surely some of these affected his research and teaching. In fact, I consider him with his often adamant views and determination to be the foremost ecologist in America (during his heyday) the essential ingredients of most successful scientists. Even at the time I admired his competitive personality, although disagreeing, upon occasion, with his behavior. Certainly he was one of the most organized, clearly focused graduate level teachers to position information in my neural lodgings.

Dauby was the academic father of numerous doctoral students in ecology, many of these friends of mine. For the most part he kept them at a distance; some he favored with warm, but detached, smiles and relatively brief office conferences; others he simply ignored, doubting their competence, begrudgingly entering into their research projects and practically never into their personal problems. Most of his students appeared to stand in awe of the man, even forming cabals among themselves and their leader, constituting a solid phalanx whenever Dauby's views were attacked by W.H. Whitaker or yet others. But that is another telling.

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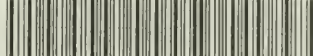
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